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ELECTRICAL REVIEW

3rd JULY, 1953

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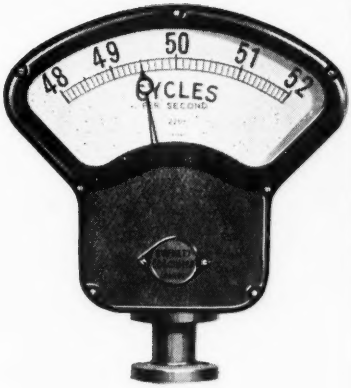

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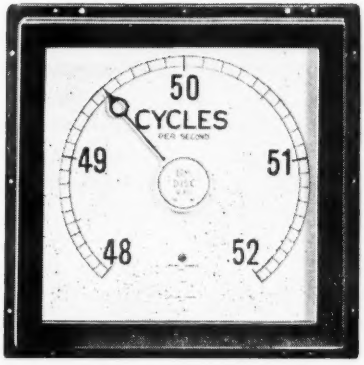

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ELECTRICAL REVIEW

3rd JULY, 1953

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. 153 • NO. 1

Path to Progress

THE decision of the Minister of Fuel and Power to free the electricity supply industry from restrictions placed on its advertising was not unexpected. As we stated last week, the Electrical Development Association has already begun its Press campaign, and the Electricity Boards have no doubt made their plans for linking up their advertising with that of E.D.A. The manufacturers of domestic appliances have continued to do their best during the period of restriction but they have barely been able to hold their own. Now they, equally with the supply authorities, may breathe again the air of freedom and work with greater hope of success.

The removal of the ban on " domestic " advertising has wider implications than is generally realized. Many concerns in the electrical industry have been built up to become balanced units, i.e., they have possessed domestic appliance departments which have been integrated with the firms' industrial production into interdependent systems. By this means they were able to run on an even keel until the suppression of the domestic side upset their equilibrium. The effects of this upon costs generally, and upon export prices particularly, have been emphasized in the speeches of many company chairmen. As recently as the Torquay British Electrical Power Convention, Col. B. H. Leeson, President of the I.E.E. and director of the British Electrical and Allied Manufacturers' Association, dealing with the question whether it was right for the housewife to use electricity, said that the answer was a definite " yes " for a number of reasons. Among these was the point that " by her purchase of electrical appliances she helps an industry whose total exports make the second largest contribution to our imports of food."

Moreover, a greater use of electricity in the home tends to lower the price of electricity to industry. To secure improved productivity, Col. Leeson's principal theme, the industrial consumption of

electricity must rise. In the absence of two-shift working this must mean greater peaks and more generating plant. Unless industry is to bear the major cost of this plant the load-curve valleys must be filled by the domestic consumer. But while increased electrification will contribute largely to the country's salvation, Col. Leeson has reminded us that factors of equal importance are greater human effort; greater production of the basic commodities; and more capital, i.e., greater economy and savings by Government, industry and individuals.

TOO MUCH DETAIL

A great deal of time is wasted by contractors and manufacturers in preparing tenders. Some customers (or their consultants) want minute details and prices of almost every screw in a job, whereas they could generally rely on the tenderers to give them satisfaction under a broader form of quotation. Some regard should be paid to the standing of the firms involved in these matters. Apparently local authorities are among the customers whose requirements are too onerous and the Electrical Contractors' Association has endeavoured to secure some amelioration of the conditions in discussions with the Association of Municipal Corporations. As a result the latter body's Law Committee has recommended some measure of relief.

NIGERIAN DEVELOPMENT

For years the centre of West African slave trade, Nigeria is now, a century later, the scene of a different form of exploitation—the economic utilization of its natural resources. With an electricity consumption of only 4 kWh a year per head of its 25 million people it at present ranks as one of the least electrically developed parts of the world. Though fuel resources are potentially great (water, coal and also possibly oil) little factual information exists to help the newly constituted Electricity Corporation of Nigeria. Coal is mined to some extent in the neighbourhood of Enugu at a cost last year of 35s a ton, which rises to over 84s by the time it reaches Lagos. For studying the technical and economic aspects of pithead generation combined with high voltage transmission, it is interesting to learn that the Corporation has been assisted by a modern aid in the A.E.I. network analyser at Willesden which has confirmed the technical possibility of building a 90 MW station at Asaba.

COAL GAS TURBINES

Prominent among the activities of the Fuel Research Board, whose report for 1952 is reviewed in this issue, are developments in the design of combustion chambers for gas turbines running on coal and peat. As a result of successful operation at atmospheric pressure of the straight-through type burning 500 lb of coal an hour, the design is to be modified for working at 3 atm. Another promising project is the application to gas turbines of the cyclone system for burning high-ash coal; fine pulverization is unnecessary and only a small proportion of ash not removed as slag has to be separated from the gas stream. The progress being made is the fruit of close co-operation in research between public bodies and companies.

DOVER-CALAIS POWER LINK

Some particulars are given on another page of the exploratory work in hand for the proposed 132 kV power connection with France. No comparable scheme exists anywhere to-day and the nearest projected is probably the crossing of the St. Lawrence River with 69 kV cables rated at 75 MW and 30 miles long. The ability to test cables up to 225 kV at Fontenay is an advantage now possessed by the French, but will be bettered if a scheme under consideration by the B.E.A. is adopted for testing cables up to 275 kV under working conditions.

Industrial Instrumentation

Second British Instrument Industries Exhibition

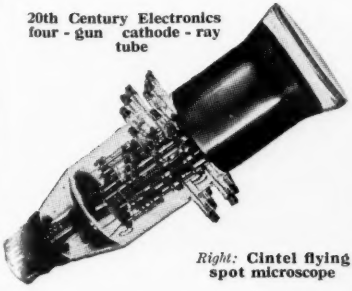
OVER one hundred and fifty of the leading instrument manufacturers are exhibiting and demonstrating their products at the second British Instrument Industries Exhibition now being held at Olympia, London (30th June to 11th July). The success of the first exhibition in 1951 has led to a decision to establish this as a biennial occasion. There is probably no commercial exhibition in the world of an equivalent size and scope specializing in instruments and instrumentation and already many buyers from all parts of the world have visited the display.

The instruments on view cover every field of instrumentation in industry, medicine, research and education. The full scope of the products of the British instrument industry is not always fully realized and the exhibition demonstrates that the widest range of all major types can be obtained from British sources. It is also worth while to remember that the industry is playing its part in the export drive by selling nearly 40 per cent of its production overseas, the value of these exports being about £14 million a year.

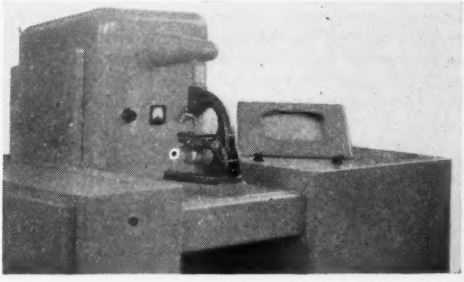
Many instruments developed for specialized research can be used in other branches of research and also in industry. Some 38 instruments developed in the various establishments of the Department of Scientific and Industrial Research are demonstrated and these include mechanical, optical, hydraulic and electronic instruments. Certain of these items offer possibilities of wider usefulness than those provided by the research for which they were first produced and they are available for further development and marketing by any interested manufacturer.

Electronic apparatus is being used to an increasing extent in all branches of science and industry and a very wide and representative selection of such items is shown by Cinema-Television, Ltd. The centrepiece of this display is perhaps the flying spot microscope developed in collaboration with Prof. J. Z. Young, of University College, London. It has been designed to overcome a number of the disadvantages inherent in conventional microscopic technique and is capable of presenting a picture of high definition and large magnification with low noise level. Another interesting piece of electronic apparatus, shown by 20th Century Electronics, Ltd., is a four-gun electrostatically focused cathode-ray tube in which there is a complete absence of intermodulation between the individual guns.

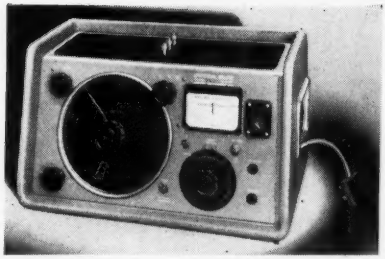
The new recording infra-red spectrometer of Unicam Instruments (Cambridge), Ltd., is intended for two main applications: for reliable double beam operation in the rock salt region for routine analytical work, for which a compact, robust and portable



20th Century Electronics four-gun cathode-ray tube



Right: **Cintel flying spot microscope**



Above: **Unicam double-beam infra-red spectrometer.** *Above right:* **Marconi universal bridge.** *Right:* **Dawe mains frequency stroboscope and Metrovick "Transva" meter with maximum demand indicator**

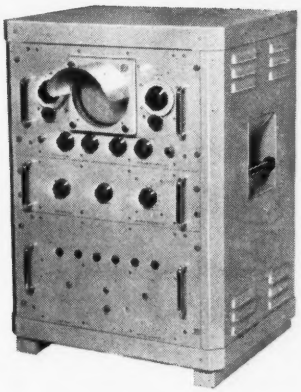
layout is indicated; and for industrial or academic research in which versatility in spectral range, resolution and recording speed are required, and are made available by means of appropriate accessories. Apart from pen oscillograph recording equipment, Southern Instruments, Ltd., have a cathode-ray polarograph, which is a versatile, rapid and highly sensitive instrument for electro-chemical analysis.

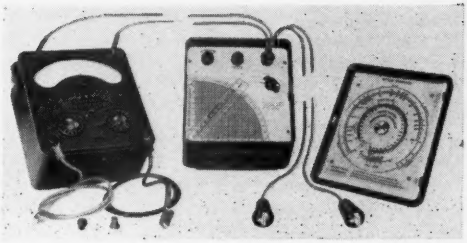
Most of the items shown by Marconi Instruments, Ltd., are for use in radio or electronic laboratories but there is a moisture meter, a pH meter, an audiometer and a universal bridge. The last is for measuring resistance, capacitance and inductance (0·1 Ω to 10 MΩ, 1 $\mu\mu$F to 100 μF, 1 μH to 100 H), and contains three bridge circuits with an oscillator and three-stage amplifier detector with automatic gain control. The large direct-reading scale, and the elimination of multiplier controls, make it very easy to operate. The products of Taylor Electrical Instruments, Ltd., are also largely for use in the radio, television and electronic industries.

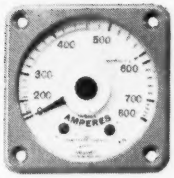
Among the widely different items shown by the Metropolitan-Vickers Electrical Co., Ltd., is a 50 kV electron microscope, a thermo-electric pyrometer, moving coil ammeters and voltmeters, a differential speed indicator and an instrument which provides an accurate direct reading of three-phase kVAh and kVA demand under all conditions of load. This "Transva" meter will be of interest to transmission engineers and others engaged on problems involving apparent as opposed to true power.

Over a frequency range of 20 c/s to 20 kc/s, the phase sensitive voltmeter shown by Solartron Laboratory Instruments, Ltd., will measure the in-phase and quadrature components of an applied test voltage, with respect to a given reference voltage. The two components are separately and simultaneously indicated on 6in scale centre zero meters. The input impedance for both channels is 50 MΩ. Seven half-decade sensitivity ranges are provided covering a voltage range of 15 mV to 15 V full scale.

The Model 8 "Avometer" electronic multi-meter and new "Avo" power factor and wattage unit are exhibited by the Automatic Coil Winder and Electrical Equipment Co., Ltd. This simple apparatus gives readings of power and power factor in single-, two- and three-phase, balanced or unbalanced supplies. It will also give the amount of reactive kVA (usually capacitive) necessary to improve the power factor of a load to a given figure.







Left: **Southern Instruments cathode-ray polarograph.** *Above:* **Avo power factor and wattage unit.** *Below left:* **Crompton Parkinson circular scale ammeter.** *Right:* **British Physical Laboratories' "Voltascope"**

A novel item exhibited by Dawe Instruments, Ltd., is a mains frequency stroboscope, which, as its name implies, is triggered at the mains supply frequency so that it will automatically "freeze" any equipment run off the same mains. The absence of a triggering device and controls renders it simple, light and inexpensive.

A range of instruments comprising a.c. and d.c. flush mounting models both in square and round cases are shown by the English Electric Co., Ltd. Examples of house service, single-phase and polyphase designs, as well as polyphase meters for switchboard mounting, are also on view. Protective relays include triple-pole and single-pole equipment and a gas-operated Buchholz relay for transformer protection. A further item of interest is a small portable electronic insulation testing set capable of providing up to 10 kV d.c. and giving a measurement of insulation up to 250,000MΩ. The output is continuously variable and non-lethal and the equipment is provided with a discharge amplifier which gives audible warning of ionization and incipient breakdown.

New designs of circular scale electrical instruments are displayed by Crompton Parkinson, Ltd. The models on view include 3·5in, 4in and 6in diameter dial ammeters, voltmeters, wattmeters and frequency meters for switchboard mounting. Apart from its usual range of indicating instruments the Electrical Instrument Co. (Hillington), Ltd., has a new negative phase sequence indicator, power factor meters and instruments measuring I cos ϕ. The Record Electrical Co., Ltd., has among its wide range of indicating instruments a comprehensive display of "Cirscale" models ranging in dial size from 30in to 2·75in for measuring direct or alternating current, voltage, power and power factor.

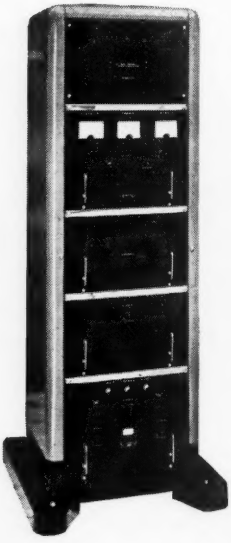
The exhibit of Ernest Turner Electrical Instruments, Ltd., comprises meters with moving coil, moving iron, thermostatic and electrostatic movements in from 2in to 6in circular, square and rectangular cases. Sub-standard voltmeters and ammeters, reflecting instruments, milliampsecond meters, small reed frequency meters and ratiometers are also shown. A wide range of indicating instruments is also displayed by British Physical Laboratories alongside a comprehensive collection of general and

special purpose electronic instruments. An interesting item here is a combined oscilloscope and valve voltmeter, known as the "Voltascope," which allows visual observation of very low frequencies, audio frequencies and supersonics with great precision and detail on the c.r.t. screen. The valve voltmeter covers the same frequency spectrum as well as d.c. Many types of indicating instruments are also offered by the Sifam Electrical Instrument Co., Ltd., while Electronic Instruments, Ltd., have ohmmeters, megohmmeters and "Chronatron" timers.

The exhibit of Nalder Bros. & Thompson, Ltd., comprises a comprehensive range of indicating instruments with short or circular scale characteristics, in round or square metal cases for switchboard use, including mining flameproof instruments, hermetically sealed and watertight patterns for special duties, or with portable Bakelite cases for workshop or laboratory use. Other items shown on this stand include relays, recorders and miniature circuit breakers.

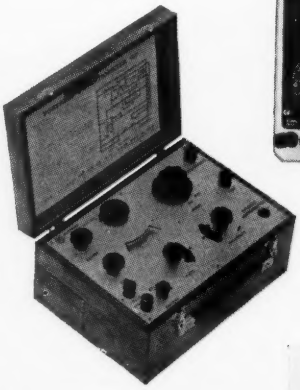
The Electrical Apparatus Co., Ltd., shows industrial measuring instruments and the instrumentation of motor control gear. Switchboard, pedestal, flameproof and miniature cases containing moving coil and moving iron movements, frequency meters, moving coil relays and earth leakage relays are on view. A single-phasing preventor and a high-speed ammeter for starting-surge investigation are demonstrated.

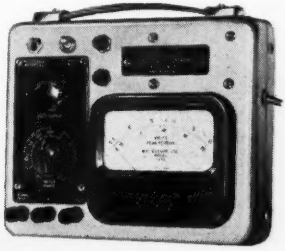
R. B. Pullin & Co., Ltd., exhibit gyroscope rotors having a wide instrument application. Miniature and small universal, low voltage instrument motors are also shown together with speed governed and permanent magnet types. Other items include electrical turn and slip indicators, heavy duty magnetic relay switches and dimming switches. An associated company, Measuring Instruments (Pullin), Ltd., has a wide range of miniature and industrial pattern meters. A special item is the new Series 15 1·5in meter which has been



Above: **Furzehill 50 c/s standard**

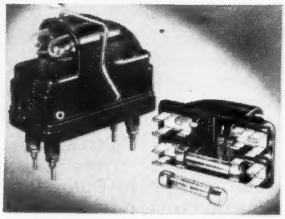
Below: **Pye portable potentiometer**





Above: **Cossor oscilloscope voltage calibrator**

Below: **G.E.C. link testing ammeter**

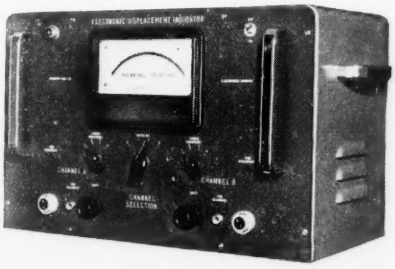


Right: **Belling-Lee twin neon fuse holder**

designed to satisfy the need for precision and robustness when space and weight are limiting factors. An internally illuminated pattern is also exhibited.

On the G.E.C. stand is a new miniature link testing ammeter for measuring up to 50 A a.c. It is in a Bakelite case and the links are fully insulated for use on bare conductors up to 600 V. Three ranges (1 to 10 A, 2·5 to 25 A and 5 to 50 A) are provided, selection being by a thumb-operated switch. The instrument measures 7in by 3in by 1⅛in and weighs 17 oz. Other new instruments include a self-contained a.c. circuit analyser for measuring voltage, current, power and power factor simultaneously, and a link testing power factor meter.

Apart from their "Scalamp" galvanometer, electrostatic voltmeter and fluxmeter W. G. Pye & Co., Ltd., have a number of other precision instruments including a portable potentiometer in which particular attention has been paid to compactness and ease of operation. Three ranges of 0–1·8 V, 0–180 mV and 0–18 mV can be selected by a switch and the determination is made by reading straight across two dials visible behind windows. A robust pointer galvanometer is incorporated and is sufficiently sensitive for most purposes, but an external galvanometer can be inserted via a jack socket if required.



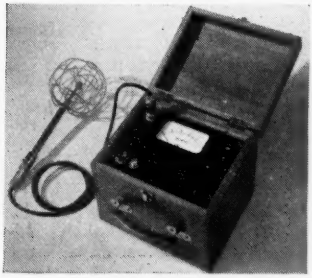
Saunders-Roe electronic displacement indicator

General purpose potentiometers, thermocouple potentiometers, resistance boxes and bridges are included by the Doran Instrument Co., Ltd., in a comprehensive display of precision apparatus. Other potentiometers are displayed by the Croydon Precision Instrument Co., Ltd., together with resistance boxes, resistance standards, bridges, thermocouple switches and a stabilized source of d.c. for meter testing. The standard supply source demonstrated by Furzehill Laboratories, Ltd., provides a 50 c/s output of 150 W at 230 V (variable) crystal controlled with a stability of 10 parts in a million. The output frequency is constant against changes in supply voltage up to 15 per cent and independent of mains frequency, while the output voltage regulation is 4 per cent from no load to full load. The company also has a stabilized d.c. power supply, a wide band sensitive valve voltmeter/amplifier and a portable frequency standard and marker generator.

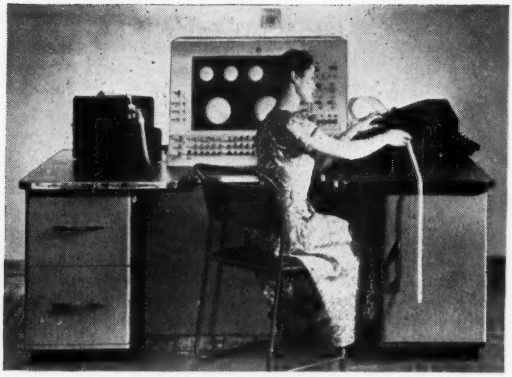
The uses to which electronics can be put in the aircraft industry are admirably illustrated by the display of Saunders-Roe, Ltd. Here are seen vibration analysis equipment, computing and servo systems, radio control and telemetering. For use in conjunction with various types of transducers there is a highly stable displacement indicator which is normally a two-channel instrument but can be modified for up to six-channel operation if required.

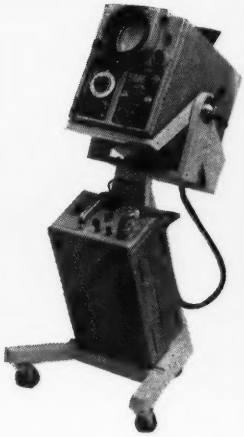
The exhibit of A. C. Cossor, Ltd., includes a voltage calibrator to provide external measurement of applied voltages to the input of oscillographs. Calibration is by direct reading on a meter with an overall accuracy of ±3 per cent and the measurement range is 3 mV to 100 V peak to peak. Belling & Lee, Ltd., have on view many accessories for use in electronic equipment and among the latest items is a twin neon indicator fuse holder assembly.

Isotope Developments ionization anemometer



Electronic equipment is shown by Isotope Developments, Ltd., and it is mainly of a specialized nature. One interesting item is an ionization anemometer. This robust





Control desk of Ferranti automatic digital computer and (right) Nagard oscilloscope with stand and ancillary equipment

portable instrument employs a radio-active source in the measuring head for investigating low-speed air currents such as are met in ventilating and convection current problems. In a similar field the Baldwin Instrument Co., Ltd., has beta-ray thickness gauges, the Farmer X-ray dose-meter, a gamma-radiation detector and a protection electrometer.

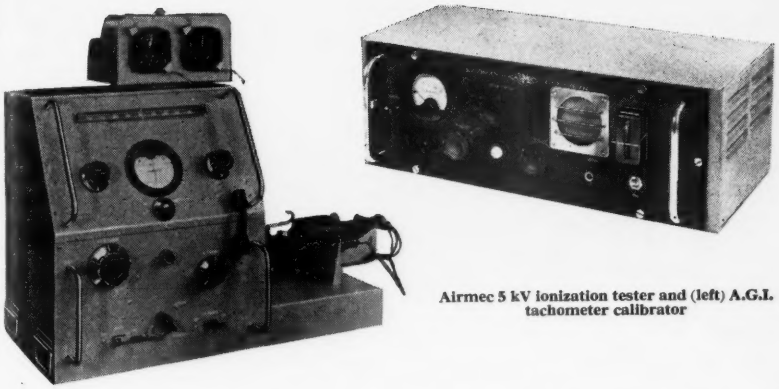
The short wave ultra-violet-ray meter shown by Hanovia, Ltd., is primarily intended for measuring radiation of wave-length 2,537 Å from low-pressure mercury discharge lamps. To avoid undue exposure of the operator the indicating meter can be detached from the main assembly while measurements are being made. Although the instrument is sensitive to low intensities, the interposition of attenuator gratings enables it to be used close to a tube of fairly high output.

Electronic instruments for various purposes are also shown by Mullard, Ltd., together with electrochemical apparatus and ultrasonic equipment. Dekatron timers, scalers, high-speed registers and associated equipment are exhibited by Labgear (Cambridge), Ltd. One fully automatic timer here uses Dekatron tubes to display the time interval directly in minutes and seconds. A switch selects the desired service, enabling the count to be taken over a pre-selected interval of time or alternatively the time taken to register a pre-determined number of counts.

The use of oscilloscopes in research and development is now common practice throughout the world and Nagard, Ltd., is demonstrating its latest models together with various items of ancillary equipment. The double-beam infra-red recording spectrophotometer demonstrated by Hilger & Watts, Ltd., draws a curve of the infra-red absorption of a substance, from which extraneous effects due to atmospheric absorption and variations of light source emission are eliminated. It employs a robust and relatively simple measuring system which is electrically linked with a pen recorder. It is claimed to be the first instrument of its class to be in regular production in Great Britain.

Ferranti, Ltd., displays electronic digital computer equipment consisting of a scale model of the complete apparatus together with a full-size control desk and high-speed tape reader, also a section of the computer rack showing the wiring and components. Other apparatus on view includes earth leakage instruments for a.c. systems, h.v. indicators and phasing equipment, a maximum demand alarm, summation metering for industrial use and impulse telemetering equipment.

Non-destructive methods of testing metallic articles are being used to an increasing extent. On the stand of Glass Developments, Ltd., is the "Ultrasonoscope" which has been developed under the auspices of the Ministry of Supply. This is an ultrasonic flaw detector with several novel features such as a "steerable

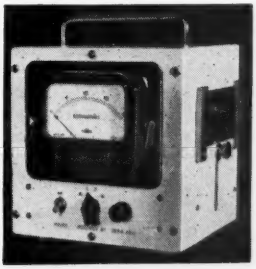


Airmec 5 kV ionization tester and (left) A.G.I. tachometer calibrator

beam" type probe, and the facility for "Sonoscope" presentation, whereby a picture similar in many ways to an X-ray radiograph can be obtained. Airmec, Ltd., shows a 5 kV ionization tester for the non-destructive testing of insulation whereby the voltage at which components commence to ionize may be readily ascertained. A similar instrument operating at from 3·5 to 20 kV is also available.

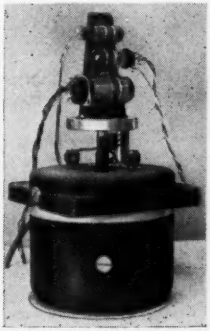
A range of special vibration equipments is exhibited by Goodmans Industries, Ltd. They comprise a permanent magnet vibration generator and associated electronic amplifiers and an oscillator. The generators are based on the moving coil principle operating a centrally moving armature that can be used to apply specific vibratory conditions to components under test.

In a Maxwell bridge capacitance is measured in terms of resistance and the known speed of rotation of a charge and discharge commutator. This principle has been varied in the calibrator for tachometers of the type used in aircraft by Aircraft & General Instruments, Ltd. Here a known capacitance is used and the speed of rotation of the commutator is measured in terms of resistance. The company is also giving a very interesting demonstration

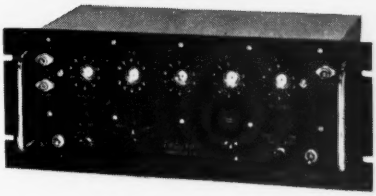


Left: **Hanovia short wave u.v. ray meter**

Below: **Goodmans vibration generator**



Above: **Cambridge quick acting recorder**



Right: **Labgear automatic "Dekatron" timing unit**

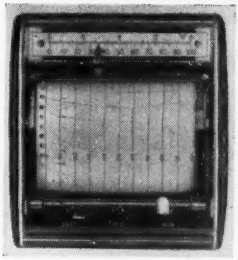
of the "Magslip" system of transmission.

The Cambridge Instrument Co., Ltd., shows the latest types of instruments for measuring temperature, CO_2, draught and pressure, chemical engineering and other industrial data, together with a selection of electrical measuring instruments. A highlight of the display is an electronic recorder with an exceptionally high response speed, giving a pen movement right across the 7in chart in 0·5 sec, which, coupled with the continuously self-balancing method, renders it adaptable to the most exacting requirements. With the multipoint instrument, which operates on the dotting principle, a complete cycle of recording dots from six different points can be obtained in 15 sec.

In the same field of activity Bailey Meters & Controls, Ltd., has panels for use in controlling large power station boilers and turbines, particularly those operating on the unit system. There are also indicators, recorders and automatic controllers associated with such panels which are applicable to processes in diverse industries.

The central exhibit of Tinsley (Industrial Instruments), Ltd., illustrates the automatic control of open hearth furnaces by Tinsley-Askania controllers which can also be used for the automatic control of water tube boilers. There is also a demonstration of a single-unit pen recording polarograph.

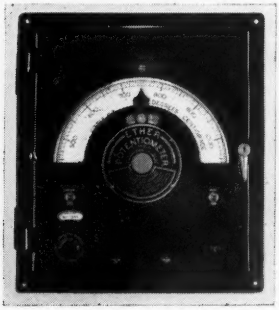
The display of Ether, Ltd., is of the same nature, consisting of temperature recorders, controllers and indicators, most of them being electronically operated. Here there is a high-speed "Wide-strip" electronic potentiometer and also a potentiometer indicator which has a 30in long scale calibrated in degrees of temperature, is electronically driven and deflects from zero

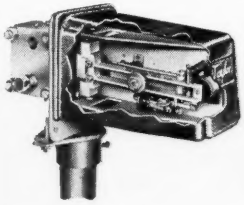


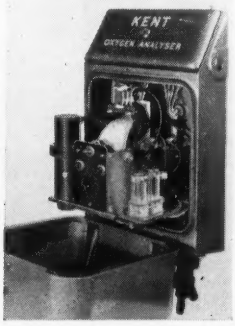
Foxboro-Yoxall "Consotrol" combined recorder and controller

to full scale in 12 sec. Fitted with a multipoint switch it can be arranged to indicate the temperature of up to 36 points automatically. It is also made as a single-point temperature controller of great accuracy, arranged for high-low, multi-stage and proportional control.

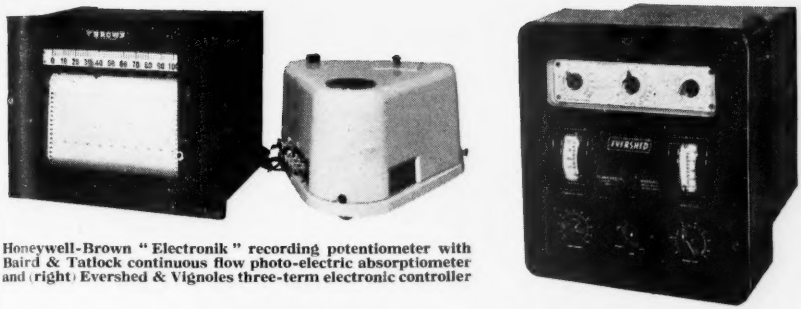
George Kent, Ltd., have a comprehensive range of control equipment covering most aspects of industry; they are also launching a new series of instruments, among them being a range of flow recorders and controllers. A full complement of power cylinders of various sizes is demonstrated, fed by an air supply in such a manner as to provide continuous alternative stroking. Other demonstrations include a new oxygen analyser with recorder, measuring the percentage of oxygen in the gas supply at the exhibition; a calorific-value controller, measuring the c.v. of the same gas supply; and a "Universal" glass-electrode pH recorder which may be alternatively switched to a flow-channel electrode passing hot water or to a tank-type electrode immersed in a liquor of which the pH value may be varied at will.







Left: **Potentiometer indicator (Ether, Ltd.).** *Above:* **Short & Mason differential pressure transmitter.** *Right:* **George Kent oxygen analyser**



Honeywell-Brown " Electronik " recording potentiometer with Baird & Tatlock continuous flow photo-electric absorptiometer and (right) Evershed & Vignoles three-term electronic controller

Also in the field of process control, Foxboro-Yoxall, Ltd., are showing indicators, recorders, controllers and transmitters for temperature, pressure, vacuum, absolute pressure, flow, level, humidity, dewpoint, liquid density, conductivity, pH, capacity, etc. The principal development here is a combined recorder and controller small enough for graphic panel or console mounting. This new series of " Consotrol " instruments is shown in operation controlling a demonstration process, thus enabling visitors to watch its behaviour under changing load conditions.

On the stand of Bristol's Instrument Co., Ltd., is the " Metameter " system of telemetering which is offered as a multiple channel recorder and remote supervisory controller. In conjunction with the British Thomson-Houston Co. the company has developed a system of telemetering by means of which 30 data or supervisory control functions can be transmitted any distance over a pair of telephone lines or by a radio link. The transmissions are unaffected by variations in line voltage or resistance. Also on view are a complete range of programme controllers for pressure or temperature and process cycle controllers and production recorders.

The exhibit of Evershed & Vignoles, Ltd., illustrates the versatility of the company's electronic system of central process control. A large graphic panel depicting a typical continuous process plant is arranged to be built flush into a wall. Miniature edgewise indicators and miniature chart recorders, operated by electronic repeater transmitters, are included in the diagram at appropriate points and knobs for setting the proportional, integral and derivative actions of the three-term controller are also included in the diagram, although the controllers themselves are grouped together in a " nested " control cubicle which can be in an adjacent room. To demonstrate the method of control and to illustrate how apparatus can be conveniently tested after installation, portable plant-simulator test sets are available on the stand.

A new arrangement, which should prove of interest to all processing industries, is the combination of the Honeywell-Brown " Electronik " potentiometer with a Baird & Tatlock type " B " absorptiometer for continuous measurement of small changes in colour, density or turbidity of liquids flowing in chemical processes. The advantage of the system is that it gives continuous null-balance measurement. It can provide pneumatic or electrical control of the process involved and can therefore be installed as part of the control plant.

The Short & Mason-Taylor " Transaire " differential pressure transmitter is a mercury-less force-balance type transmitter which converts a differential pressure into an equivalent 3/15 lb/sq in output. It is available in two ranges, one continuously adjustable from 0/20 to 0/200in of water, the other from 0/80 to 0/800in of water; the working pressure rating of the body is 1,500 lb/sq in. Apart from meteorological and aircraft instruments Negretti & Zambra, Ltd., also have process control gear and associated instruments on view.

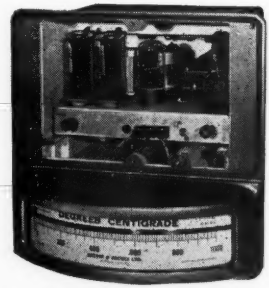
The exhibit of the Electroflo Meters Co., Ltd., demonstrates the company's ability to undertake the complete instrumentation and automatic control of industrial plant as it shows in compact form comprehensive measurement and control schemes for all major industries. The scheme for a central power station with pulverized-fuel-fired boilers under completely automatic control and the metering systems for industrial

steam power and processing plants are of particular interest to electrical engineers.

All types of industrial and marine liquid content gauges, including examples of hydraulic, hydrostatic, direct reading and electronic systems, are exhibited by Simmonds Aerocessories, Ltd. A complete range of pneumatic and electrical instruments for the control and measurement of temperature, flow, specific gravity, pressure and liquid level is displayed by Sunvic Controls, Ltd.

The theme of the display by Electro Methods, Ltd., is temperature and humidity control. New products will include glass contact thermometers for close control to 0·01 deg C and precision cartridge thermostats operating on a new suspension strut system which provides close control and is compact and unaffected by vibration. Magnetic amplifiers and saturable reactors for heater control are also shown.

The exhibits of Kelvin & Hughes (Industrial), Ltd., are also concerned with industrial control. Here there is a range of electronic process controllers offering advantages to industries using semi-automatic or fully-automatic control systems.



Kelvin & Hughes combined electronic controller

Industrial Pyrometer Co.'s " Pyrostat "

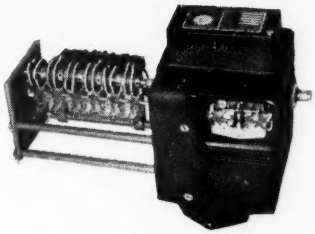
By adding units, three different kinds of controller, two-position, proportional and compound, can be built up. By making further additions to the standard equipment the unit can be arranged as a programme controller or multi-point temperature indicator. An extensive range of temperature measurement and control apparatus is also shown by the Foster Instrument Co., Ltd. Thermometers of various types are displayed by G. H. Zeal, Ltd., the British Rototherm Co., Ltd., and Coley Thermometers, Ltd.

Not only do Elliott Brothers (London), Ltd., offer a wide range of instruments but also a complete instrument service to industry through their association with the Fisher Governor Co., Ltd., whose level controllers, diaphragm motor valves and other specialities complete the equipment for automatic process control. The exhibits here are varied and include the " Elliottel " remote indication and control system, magnetic amplifiers, strain measuring equipment, printed circuits and microwave instruments, to name but a few. Special valves for use in control schemes are exhibited by British Arca Regulators, Ltd.

The " Pyrostat " shown by the Industrial Pyrometer Co., Ltd., is a simple, reliable, and inexpensive temperature controller for use with relatively small heat processing plant. Its design is unorthodox and it has been simplified by a reduction in the number of component parts. Control action may be of two kinds, two-position or proportional-position.

The heating system control apparatus displayed by the Thermocontrol Installations Co., Ltd., includes a step controller which is suitable for operating multiple loads in any required sequence. It comprises from three to ten mercury switches which can be separately adjusted to operate at any point within the rotation of the motor shaft. A 24 V motor is employed and it can be used with modulating, pressure and temperature controllers. A re-cycling feature is available.

The new developments introduced by Elcontrol, Ltd., include infra-red sensitive equipment, a proximity switch, long-range photo switches and a photo-electric temperature controller. The latter is an on/off controller providing relay operation at a predetermined colour temperature and making use of a small photocell head with a focusing arrangement which is mounted to view the incandescent object. It is intended



Thermocontrol step controller

for a range of 750 to 1,750 deg C which makes it suitable for the temperature control of resistance butt welding and h.f. heaters, electric furnaces, etc.

The exhibits of Radiovisor Parent, Ltd., comprise a representative range of industrial photo-electric and electronic control and measuring equipment and it is shown how these items can be adapted to suit various industrial applications. Other photo-electric instruments and apparatus are shown by Evans Electro-selenium, Ltd., and Megatron, Ltd., while C. F. Casella is demonstrating a stabilized d.c. light source for laboratory use.

Laboratory apparatus, including ovens, balances, stirrers and special items of furniture are displayed by such manufacturers as Griffin & Tatlock, Ltd., and J. W. Towers & Co., Ltd., and high vacuum plant of all types is shown by W. Edwards & Co. (London), Ltd. Mercury vapour pumps, mercury vapour and hydrogen discharge lamps, special types of immersion heaters and like apparatus are shown by the Thermal Syndicate, Ltd. Air compressors, exhausters, reducing valves, etc., are displayed by Williams & James (Engineers), Ltd. Instrument and resistance wires are shown by the London Electric Wire Co. and Smiths, Ltd., and the Vactite Wire Co., Ltd. Sintered permanent magnets and fabricated parts in tungsten, molybdenum, tantalum and zirconium are exhibited by Murex, Ltd.

Engineering in Europe

Survey of Current Literature

DESPITE the many attempts made it has not yet been possible to evolve a satisfactory general method of calculating the sags in various spans of a transmission line carrying unequal ice loads, although it is possible, given the time, to calculate any special case with an accuracy sufficient for practical purposes. This author chose the way of calculating catenaries for spans of 150, 250 and 350 m, span numbers of 3, 9, 15 and more per section, and tensions 75 per cent and 100 per cent of the maximum stress permitted by the regulations VDE0210 and for some of the more usual steel-aluminium and copper conductor types of large and small cross sections.

From the sag-tension relations computed for a number of characteristic points it is possible to obtain any intermediate values by interpolation owing to the continuous character of the functional relations of the quantities involved. As a matter of convenience, the curves do not represent the sag-tension relation itself, but the tensile stress in a field with ice load adjacent to a field the load of which has dropped off, relative to the maximum permissible tensile stress, which is very suitable for interpolation. Two lengths of insulator strings are considered, viz. 1·6 and 3·2 m. Some numerical examples and tabulations show the working of the method.—" Calculation of the Sag of H.V. Lines under uneven Ice Loads," K. H. Feist, *Elektrizitätswirtschaft*, Vol. 52, No. 5, pp. 107–110, March, 1953, in German.

Inhomogeneities in Cables

This author derives the fundamental conditions of the possibility of using reflection methods for fault location in cables, particularly discussing the difficulties arising from the fact that the wavelength constant is not strictly proportional to frequency which results in distortions of

the pulses emitted. This effect is due to the fact that the inductance of the cable comprises two components one of which is a consequence of the skin effect and therefore depends on frequency. The considerations show that, nevertheless, the distortions may be compensated to such an extent that, given a suitably designed set-up, an accuracy of location of a fault of the order ± 1 m on a cable length of 5 km should be achievable. The repetition frequency of the pulses to be used must be 500 c/s.

The basic design of a locating circuit shown comprises generator, three phase shifters and as many distorting circuits for converting the sinusoidal wave form into meander form; the latter is then chopped up by differentiating stages into very short-lasting pulses. The latter trigger the "primary" pulses proper, preferably produced by thyratrons the discharge resistance of which is matched to the characteristic impedance of the cable. The reflected pulses are compensated and, through a wide-band amplifier, reach the c.r.o. by which the time difference is measured. Experience with such a set-up confirms the usefulness of the method.—"Methods of Fault Location and Measurement of Inhomogeneities in Cables based on the Echo-Sounding Principle," W. Kroebel, *Z. angew. Phys.*, Vol. 5, No. 2, pp. 48–52, February, 1953, in German.

New Electrostatic Generator

The type of machine suggested in this article comprises insulated inductors and double conveyor belts, the main problems to be solved being the equalization of the potentials of inductor and collecting combs, or brushes, during the discharging periods and interruption of this state of equipotentiality during the recharging periods, which must be short and during which the potential differences between inductor and collectors must be as high as possible. Also, the change between the two states should be obtained without any displacement of the connections of the said elements. The only way to achieve this is by discharges across a spark gap supplied by the machine itself, since the discharges ionize the air layer between inductor and rotating disc and lead to the accumulation of new charges on the inductor surface. That this principle works is proved not only by a simple, though necessarily lengthy, analysis based on separate equivalent circuits for every stage of the process, but also by a comprehensive test report on a small experimental generator which certainly worked satisfactorily up to 110 kV, and that in air at atmospheric pressures. Whether any inferences can be drawn as to the possibility of the operation of a generator of this type at voltages of the order of MV (the range in which electrostatic machines become interesting) is not stated. —"A New Electrostatic Machine on the Influence Principle," P. Jolivet, *R.G.E.*, Vol. 62, No. 1, pp. 25–29, January, 1953, in French.

Feedback Amplifiers

Although the importance of the principle of negative feedback for the linearization of amplifier characteristics and for reducing the dependence of these characteristics on the valve characteristics is well known, the improvement achievable in the input resistance of the amplifiers by the use of negative feedback is generally not quite realized. Yet it is this fact that may be utilized for matching amplifiers and electronic measuring instruments to their specific purposes. These inherent possibilities may be fully understood only by a theoretical consideration of the basic circuits as presented by the author, who then applies the knowledge gained to the design of simple and more elaborate valve electrometers and amplifiers characterized by extremely high input resistances and small capacitances.

An essential feature of all the circuits shown is that they use "commercial" valves throughout without special valves, which is of some economic importance. Further important characteristics of the circuits shown are that they can be made self-recording and that their sensitivity is so high that a variation of the grid charge by 1,000 electrons is visible on the record. The stability of the zero is so good that it needs to be adjusted only once a day. The settling-down period to the final value is short, even at the feeblest currents.—"D.C. Amplifiers with Negative Feedback," A. Ehmert, *Z. angew. Phys.*, Vol. 5, No. 1, pp. 24–33, 1953, in German.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates. —Editors, *Electrical Review*.

"Pipe-Lines" for Microwaves

Associated Problems Need not be Insuperable

RECENT researches into the transmission of electric power at high frequencies have shown that "go" and "return" wires forming a conventional electric circuit are not necessary. It is now possible to make ultra-high-frequency electromagnetic waves travel along the inside of a hollow copper tube much as water may be induced to flow along a pipe or, alternatively, waves may be guided along the outside of the tube without setting up radiation. The latter idea was initiated by Sommerfeld in 1899, but it was not until half a century had elapsed that an American worker, G. Goubau, gave it real practical value by demonstrating simple methods of launching the waves and of confining the field within a short distance of the surface of the conductor.

London Experiments

Two closely associated investigations on wave-guides are being undertaken in the Electrical Engineering Department of University College, London, by a team of workers under Professor H. M. Barlow, Ph.D., B.Sc. (Eng.). For several years Professor Barlow's team has been doing experimental work on tubular wave-guides with very encouraging results. Latterly, they have also been engaged in an investigation of the transmission of surface waves on single conductors, this work being under the auspices of the Department of Scientific and Industrial Research.

Experimental work at University College has established that microwaves can be guided without serious loss either on the inside of a metal tube, or, alternatively, on the outside of the tube. It should, therefore, be possible to use the inside space for propagating a modulated microwave for multi-channel communication, the conductor itself for the transmission of electric power at, say, 50 c/s and in certain cases the outside of the conductor for another microwave; thus the conductor becomes in effect a triple purpose link. The potential benefits of such a development are obviously great.

A tubular guide of circular section supporting a particular form of wave inside it has the unique property that the loss falls as the frequency is raised. The investigators have therefore employed a frequency of about 35,000 Mc/s, which is certainly higher than has ever been attempted previously in this field. In view of the impossibility of manufacturing special wave-guide sections to fine mechanical tolerances over lengths of many feet, commercial copper tubes were chosen deliberately for the experiments. It is possible to calculate the performance of the guide at these high frequencies, and the investigators are at present engaged in checking whether practical performance is in accordance with what theory predicts. It is too early as yet to state definitely that expectations will be realized, but the results of experimental work are regarded as highly encouraging and Professor Barlow is confident that existing difficulties will be overcome.

Trunk Wave-Guide

In a country such as Britain, where distances are relatively not large but in which great centres of population exist, there must inevitably arise a very big demand for independent communication channels between such centres. The number of independent channels provided by a wave-guide could be numbered in thousands, as compared with the four to six hundred channels obtainable with coaxial lines operated in the region of a few Mc/s. Moreover, it so happens that the power lines forming the grid necessarily link up centres of population and, since the same routes are often required for communication circuits, it would obviously be a great economy to use the same tubular conductor for both purposes. Another favourable point is that when the voltage of an overhead line exceeds a certain level, the use of a tubular construction

becomes very advantageous to power engineers. The objective of the workers at University College is thus a trunk communication wave-guide which might well offer simultaneous services in the transmission and distribution of electric power. These arrangements would not necessarily be confined to an overhead system, for it is possible that underground and underwater cables might be similarly treated, providing links between this country and Ireland and the Continent, both for communication and for television.

The most recent coaxial cable employed in television is limited to a maximum frequency of 20–25 Mc/s and provides for one, or at most two, television channels, together with a few control circuits. The tubular wave-guide, on the other hand, should be capable of making provision for some 2,000 simultaneous telephone conversations and a number of television channels.

Since the Post Office and the British Electricity Authority would be jointly interested in the use of wave-guides for the transmission of electric power, communications and/or television, such a development would provide a very close link between these two bodies and might well revolutionize the entire organization of electrical power distribution and communications.

Low Attenuation

The services offered by tubular wave-guides and by lines operated at lower frequencies have been compared by Professor Barlow.[1] Attention was drawn in the first place to the remarkably low attenuation obtainable with a suitably designed wave-guide of this form. A copper tube of 1½in diameter, operated at 40,000 Mc/s, theoretically has an attenuation of only 6 db/mile. The same guide operated at 20,000 Mc/s has an attenuation about three times as large. This compares with between 6 and 7 db/mile for the standard coaxial line at 1 Mc/s, or about 1 db/mile for the usual form of underground telephone cable operated at ordinary speech frequencies In view of the excellent screening properties of a wave-guide, a drop of up to 60 db can be allowed in the power level over any one section; therefore, at 40,000 Mc/s a copper tube of 1½in diameter should only require repeaters at intervals of 10 miles. The London–Birmingham coaxial line is employed as a means of transmitting a 50 c/s power supply to repeater stations in addition to providing communication channels. The same arrangement could be used with even greater simplicity for the wave-guide.

If the tubular wave-guide is constructed so as to enable it to be employed as an overhead power line at 132 kV 50 c/s, it must be compared with the usual steel-cored aluminium conductor having 30 aluminium strands and seven steel strands, each of 0·111in diameter. This overhead power line has an equivalent copper sectional area of 0·175 sq in, an overall diameter of 0·77in, and a tensile strength of about 17,000 lb. To give the same copper section the guide of 1½in diameter would have to have a wall thickness of about 0·036in, which is not an inconvenient size. The main problem lies in providing the necessary tensile strength, though a layer of cadmium copper wires spiralled over the outside of a thin copper tube acting both as the necessary tubular guide and as a supporting core structure might be employed. The larger diameter of the conductor would be an advantage in avoiding corona at the higher transmission voltages which are likely to come into use in the future. In view of the number of communication channels offered and the value of such a wave-guide for high definition television, it is considered that an arrangement of this nature would be fully justified.

Particular attention has been devoted at University College to the wave-guide itself, because in industry and elsewhere rapid progress is being made in developing the necessary terminal equipment for the corresponding microwave radio links, and it is anticipated that this equipment will be equally applicable to the tubular wave-guide. A disadvantage of the radio beam is that it is subject to interference, and that is a matter of great importance in television and long-distance communication, whereas the tubular wave-guide would be completely screened.

Surface Waves

At the shorter wavelengths single wire wave-guides offer in some cases a very useful alternative to hollow metal tubes as a means of linking together different parts of a microwave equipment.

When radio waves are propagated through space in the normal way, they

spread out rapidly from the source so that only a small proportion of the power radiated is collected at the receiver. Surface waves, are characterized by their ability to travel in a straight line over a single interface between two media (e.g., air and a metal conductor) without losing energy by radiation. There are three main forms of surface wave, all of which are manifestations of the same basic phenomena. They are known respectively as the Zenneck wave, the radial wave, and the Sommerfeld-Goubau wave.

The first two, the Zenneck and radial waves, are both propagated over a flat surface, but the third type is propagated over a cylindrical surface and is particularly interesting because it enables large amounts of microwave power to be transmitted from one place to another with relatively very small losses. Goubau's results for enamelled wire 2 mm in diameter show, for example, that at frequencies between 1,000 and 5,000 Mc/s the total loss in a transmission line 37 metres long and of an enamel thickness of 0·05 mm is of the order of 2 db. Moreover, some 800 kW of peak power can be transmitted at a frequency of 3,000 Mc/s along the outside of a single 12 s.w.g. bare copper wire and nearly the whole of this power is confined within a radius of about one wavelength.[2] At present, however, these high powers can only be generated in the form of pulses. If they could be supplied continuously a system comparable with the present power grid distribution network of the United Kingdom could be provided.

Goubau's Experiments

So far, there have been no serious attempts to develop applications for this new form of transmission, even in the United States, because experimental work is not yet sufficiently advanced and there are still a number of problems to be solved. Goubau has been continuing his experiments by using large wires (of $\frac{1}{4}$in and $\frac{1}{2}$in diameters) with a coating of dielectric which brings the total diameter to about $\frac{3}{4}$in, and at frequencies of the order of 180 Mc/s he has been getting quite satisfactory transmission over distances of hundreds of yards.

In view of the long-term possibilities of this field of research, some work on the propagation of radio waves along wires was started by the D.S.I.R. at the National Physical Laboratory and the Radio Research Station. Grace and Lane[3] have described experiments with various types of single-conductor transmission line, consisting of lengths of 18 s.w.g. bare, tinned and enamelled copper wire. The results are in good agreement with the theoretical work of Goubau and confirm the efficiency of the dielectric-coated wire as a wave-guide at those frequencies, when used in conjunction with suitable launching and receiving horns. For example, for enamelled 18 s.w.g. copper wire, the measured loss in transmission along the line is 0·07 and 0·26 db/m at the frequencies of 3,300 and 9,400 Mc/s respectively. Additional measurements, made at the Radio Research Station, to determine the order of magnitude of the losses caused by the introduction of bends in the wire showed that when a length of 7 m of enamelled wire was bent into an arc of 14 m radius . . . thus giving an angle of about 30 degrees between horn axes . . . the total loss at 3,300 Mc/s increased from 2·5 db to 5·0 db.[4]

Fundamental Problems

Due to heavy commitments in other directions the D.S.I.R. has been obliged to suspend its own work, but on behalf of the Department Professor Barlow and his colleagues are investigating the fundamental problems involved. These fall into three main categories: (i) the launching of the waves at one end of the line and their efficient collection at the other; (ii) supporting the wire when long lengths are required; and (iii) the difficulty of getting the waves to follow the wire round a corner.

The problems of finding suitable supports for the wire and of negotiating corners are of critical importance, because discontinuities in the wire tend to distort the waves and cause radiation; as soon as any loss of energy occurs the efficiency of the wire as a transmission line is substantially reduced. Until these fundamental problems have been fully solved, the system cannot be regarded as a practical engineering proposition for transmission over large distances.

Goubau has found a method of supporting the wire by using nylon cords, which do not seriously interfere with the propagation of the wave along the conductor. He has experimented in the United States with a wire about 2½ miles long supported

by nylon cords and carrying a surface wave. So far as losses were concerned this guide was found to be quite suitable for communication purposes.

To conduct the energy round a bend it is necessary to modify the surface of the guide either by coating it with a dielectric, or by corrugating it, thus tending to confine the field more closely to the surface and permitting the guide to be bent to some extent without serious loss.

The Electrical Department of University College, London, has always specialized in microwave problems and the study of surface waves is a logical extension of its previous activities. This work has now reached a stage at which the results have been recorded in a paper submitted to the Institution of Electrical Engineers, and in Professor Barlow's view sufficient has been accomplished by research workers in Britain and the United States to show that none of the problems need be regarded as insuperable.

The system is likely to find its principal applications in linking together two parts of a microwave equipment and possibly to a limited extent for communication; the limitation being due to susceptibility to interference from outside sources. Though the propagation of radio waves along wires for long-distance transmission is still in its infancy, it is quite feasible for short vertical runs such as a feeder to an aerial system.

Attention has also been given to surface waves which are propagated over flat surfaces. Though discovered in 1909, Zenneck waves have never been actually produced, but work is in progress at University College on the launching of a radial surface wave over a flat reactive surface, and if a method can be found of doing this efficiently, important practical applications are envisaged.

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[2] BARLOW, H. M., Proc. I.E.E., Vol. 99, Pt. III, p. 21, 1952.
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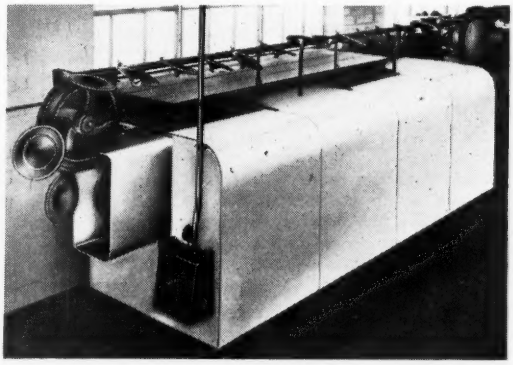
[4] RADIO RESEARCH, 1951.

Infra-Red Drying of Loudspeaker Cones

THE accompanying picture shows an infra-red element plant installed at the works of Acoustic Products, Ltd., by the Metropolitan-Vickers Electrical Co., Ltd., for extracting moisture in the manufacture of loudspeaker cones. Wire mesh spinnings corresponding to the size and shape of the finished cones are passed through a water solution in which is suspended resin impregnated wood pulp. The process ensures automatic deposition of the requisite thickness of suspended material on the spinning, and automatic removal of much of the water. The infra-red oven, through which the cones are passed, completes the drying, leaving a rigid cone to be taken from the spinning. The plant, which is 12ft long with a total loading of 30 kW, is fitted with eight standard "Metrovick" infra-red element projectors. A heat control unit is incorporated and with variable speed conveyor enables various drying times to be obtained, according to the type of cone to be processed.



"Metrovick" infra-red element projectors for extracting moisture in loudspeaker cone manufacture

VIEWS on the NEWS

By REFLECTOR

THERE will be approval in the electrical industry of the Treasury's refusal to give preferential treatment in the matter of income tax rebate to solid fuel burning appliances. The Economic Secretary (Mr. Maudling), in refusing to accept an amendment to the Finance Bill to this effect, seemed to me to go out of his way to explode the case of the advocates of these appliances. He pointed out that it was arguable whether they reduced atmospheric pollution or saved fuel. It seemed that their only advantages were that they were continuous in operation and provided added comfort. I have been chided in the past for expressing such views so this " official " support is welcome.

* * *

When the first conference of the Electrical Contractors' Association was held in 1926, at Brighton, Mr. T. E. Alger (of Newport) was the President; indeed he was responsible for initiating the conference. Mr. Alger told me at the Bournemouth conference last week that up to quite a late stage the fate of the arrangements made for this first conference was very doubtful but, in the event, the members turned up in sufficient numbers to ensure a resounding success which has since been repeated each time. While at Bournemouth Mr. Alger attained his eightieth year and this was celebrated in a fitting way by the delegates at his hotel and at the subsequent smoking concert.

* * *

Mr. H. H. Jowers, who was formerly engineer in the Darlington District of the North Eastern Electricity Board, has sent me a copy of a menu for the first annual dinner of the " Grimsby Arcs " held at the Ship Hotel in that town on 8th January, 1903. It is drawn up in the rather tiresome allusive and punning style which was common in those days and is still occasionally used for staff dinners. Such terms occur as " d'Ampère Soup," " Arc Fritters " and " Sparkless Hare." But, apart from this, which of course is of its period, interest lies in some of the names to which there are veiled references. Mr. Jowers says that at that time Lt.-Col. W. A. Vignoles (later director of E.D.A.) was the chief engineer at Grimsby and with him were Messrs. Channon (assistant chief), Etherington (mechanical engineer), Norton (chief clerk) and Furniss (installation engineer).

* * *

It cannot be said that the two or three charities connected with the electrical industry make very severe calls on its members' pockets and yet such small demands as they do make are not satisfied without much persuasion. The case of the Royal Commercial Travellers' Schools presented by Mr. Leslie Gamage, the president, in last week's *Electrical Review* is an instance of this. Mr. Gamage had to point out that although the electrical industry was responsible for sixteen orphan children in the Schools it contributed only £600 a year towards the cost of their keep and education amounting at £240 a head to an annual amount of £3,840. I agree with Mr. Gamage that this deplorable situation will not be allowed to continue now the facts have been presented to the industry.

* * *

There was a diversion at last week's luncheon of the Batti-Wallahs' Society which I attended. Mr. G. S. Gibson, who had been speaking on the industrial development of British Columbia, announced that he would show a sound film in colour of the timber industry. The film commenced, but there was no sound. Mr. Gibson's appeal, " Is there an electrician in the house? " met with a ready response, however, and the fault was quickly rectified. The film then recommenced, complete with sound.

PERSONAL and SOCIAL

News of Men and Women of the Industry

TWO new directors have been appointed to the board of the General Electric Co., Ltd., **Mr. O. W. Humphreys,** B.Sc., F.Inst.P., M.I.E.E., and **Mr. A. L. G. Lindley,** M.I.Mech.E. Mr. O. W. Humphreys, who is the director of the company's research

Mr. O. W. Humphreys

Mr. A. L. G. Lindley

laboratories at Wembley, joined the staff of the laboratories in 1925 and in 1927 was appointed to its leading scientific staff in charge of the heat group. During the war he acted as assistant director with general responsibilities for administrative matters. Mr. Humphreys is also a member of the Council of the Electrical Research Association and a director of E.R.A. Patents, Ltd.; vice-president of the Institute of Physics; member of the National Committee of the International Electrotechnical Commission; chairman of the Telecommunications Standards Committee of the British Standards Institution; member of General Council of B.S.I.; member of the Council of the British Welding Reseach Association; chairman or member of B.S.I. technical committees; and a member of the Council of the I.E.E.

Mr. A. L. G. Lindley joined Fraser & Chalmers Engineering Works in 1918 as an apprentice, and after spending some years as an assistant engineer in the Mining Department, was appointed in 1932 chief engineer of the British General Electric Co., Ltd., of South Africa. He was later appointed assistant general manager and a director of that company. Returning to England in 1949, he became general manager of the Fraser & Chalmers Engineering Works.

Mr. F. R. Rubens, secretary of Reliance-Clifton Cables & Industrial Products, Ltd., has been appointed a director of the company.

Mr. P. L. Garrett retired from the editorship of the *Ironmonger* on 30th June. Mr. Garrett joined the staff of that journal in 1914 as a sub-editor, in due course becoming assistant editor and succeeding Mr. W. A. Young as editor in 1934. **Mr. P. W. Bax,** assistant editor, succeeds him.

Mr. J. R. Jones, manager of the North Western Sub-Area, London Electricity Board, retired on 30th June, and **Mr. C. W. Blake,** manager, Western Sub-Area, is now responsible for the management of the North Western Sub-Area. The Sub-Area and District organization in the North Western Sub-Area will continue to function as at present.

Mr. Hugh McC. Jack, B.Sc., relinquished his executive duties as chief electrical engineer of the British Thomson-Houston Co., Ltd., on 30th June, but retains his directorship. He is succeeded by his chief assistant, **Mr. G. S. C. Lucas,** O.B.E., M.I.E.E., who has also been appointed a director. Mr. Jack has been closely associated with the design of electrical machines for virtually the whole of his professional life, specializing in a.c. plant of advanced design. With the exception of a short spell in Germany (1910-11) Mr. Jack has been associated with the B.T.H. since 1908. From 1922 he was the manager of the A.C. Engineering Department until, in 1945, he was appointed chief electrical engineer of the company with, a year later, a seat on the board of directors.

Mr. Lucas joined the B.T.H. Co. in 1915, and a year or two later began an engineering apprenticeship, at the conclusion of which he gained a B.E.A.M.A. scholarship to the City and Guilds (Eng.) College. In 1925 he returned

Mr. H. McC. Jack

Mr. G. S. C. Lucas

to Rugby as an assistant to the then head of the B.T.H. Research Laboratory, the late Mr. R. C. Clinker, and specialized in electronic research which led to the development of the electric gramophone, sound-film equipment for the cinema, and the 16mm sound-film projector. In 1932 Mr. Lucas was appointed head of the electrical and development section of the Research Laboratory under Mr. (now Sir) Hugh Warren, D.Sc., with responsibility for electrical measurements and developments in the audio-frequency field. In recognition of his contribution to the wartime development of radar fire control equipment, Mr. Lucas was awarded the O.B.E. in 1944. In 1945 he was appointed manager of the newly-formed Electronics Engineering Department, relinquishing this position shortly after to become assistant chief electrical engineer. Mr. Lucas has been a member of Council of the I.E.E. since 1950.

Mr. F. H. Beasant, B.Sc., M.I.Mech.E., M.I.E.E., M.I.Loco.E., who, as we recently reported, has been elected to the board of the Anti-Attrition Metal group of companies, was educated at the Bristol Grammar School and the University of Bristol. After an apprenticeship with the Metropolitan-Vickers Electrical Co., Ltd., at Manchester and Sheffield, he was in Poland in connection with a railway electrification contract, returning to England in 1936 to take up an appointment in the Chief Mechanical Engineer's Department of the L.N.E.R. During the war he was lent to the Ministry of Supply and became engineering manager of the Royal Ordnance Factory, Spennymoor, Co. Durham. Since 1947 he has been manager of the Traction Division of Crompton Parkinson, Ltd., Chelmsford. Mr. Beasant, who will be responsible for directing all the sales and associated activities of the group, took up his new appointment at the London office of the Anti-Attrition Metal Co. at 56, Victoria Street, S.W.1, on 1st July.

Mr. F. H. Beasant

Mr. R. J. Cotton, previously sales engineer with Benjamin Electric, Ltd., has joined the London staff of Pyrotenax, Ltd., as technical representative in that area.

Dame Caroline Haslett, D.B.E., J.P., president of the International Federation of Business and Professional Women, left for Berlin on 27th June, to speak to the Berlin Business and Professional Women's Club. She is also speaking to the Hamburg Club and to the Danish Federation in Copenhagen. She will then go to Sweden to preside at the sixth Triennial Congress of the International Federation which opens in Stockholm on 5th July.

Mr. F. S. Naylor, B.Sc.(Eng.), M.I.E.E., A.C.G.I., who has been an assistant commercial manager of the British Electricity Authority for the past five years, has been appointed specifications and contracts engineer in the Chief Engineers' Department of the Authority. Mr. Naylor served a mechanical and electrical engineering apprenticeship with the British Thomson-Houston Co., Ltd., and, after a period of power station testing work with that company, was appointed technical assistant to the chief electrical engineer of the Imperial Chemical Industries works at Billingham on the construction of the power station there. From 1928 to 1935 he served as technical assistant to the West Midlands Joint Electricity Authority and was engaged on the specification, design and construction of Ironbridge power station and the development of the Shropshire distribution system. For the next two years he held the post of technical assistant to the Sheffield Corporation Electricity Department, and then became chief electrical engineer to Firth-Brown of Sheffield. From 1940 to 1948 he was successively borough electrical engineer and manager at Southwark, Gravesend and Islington. He became assistant commercial manager to the B.E.A. on nationalization of the supply industry.

Mr. F. S. Naylor

Mr. J. R. C. Johnson has been appointed manager of the contracts division of the Marconi International Marine Communication Co., Ltd. Mr. Johnson, already well known in shipping circles in his previous capacity of contracts representative, will continue to operate from Marconi House, Strand, London, W.C.2. He joined the Marconi Marine Co. as a seagoing radio officer in 1917, and while at sea served in the vessels of a large number of shipping companies. Following a period on installation and maintenance work ashore in London he returned to the sea staff for a few voyages before being appointed to contracts work at the London office.

Mr. J. R. C. Johnson

Mr. Hugh E. Easton, the chief accountant of Johnson & Phillips, Ltd., has retired at the age of seventy-five after nearly sixty years' service with J. & P. The company held a dinner in Mr. Easton's honour at the Devonshire Club, St. James's, on 19th June, when he was presented with a radiogram by the chairman, Mr. G. Leslie Wates, J.P., on behalf of the company, and with a clock and cheque by Mr. W. F. Smith, works accountant, the gift of Mr. Easton's colleagues.

Mr. H. E. Easton

Mr. O. E. Trivett, A.M.I.E.E., M.Brit.I.R.E., has been appointed a director of Aerialite, Ltd. He joined the company in 1950.

Mr. J. Jenkins, formerly sales and service engineer with Fraser & Borthwick, Ltd., has joined the staff of the Belmos Co., Ltd., and will be concerned with flameproof and industrial control gear sales in the Scottish area.

Mr. A. R. Cowtan has been appointed manager of the Bristol district of the Hotpoint Electric Appliance Co., Ltd., responsible for the sales of the company's products in the South West of England. Mr. Cowtan was previously sales representative for Devon and Cornwall. **Mr. Alan Smith,** formerly of the South Western Electricity Board, Penzance, succeeds Mr. Cowtan as sales representative.

Mr. A. R. Cowtan

The Trinidad and Tobago Electricity Commission has appointed **Mr. Walter M. Cotsworth,** A.M.C.T., A.M.I.E.E., as assistant general manager. Mr. Cotsworth was educated at Arnold School, Blackpool, and the Faculty of Technology, Manchester University, and received his training and early experience with Manchester Corporation Electricity Department. During the last war he was loaned to the Department of Scientific Research, Admiralty, and was later permanently established in the Royal Naval Scientific Service. He joined I.C.I., Ltd., Wilton Works, in 1947, as electrical construction engineer, and in 1950 became senior assistant engineer, Generation Construction Department, at the British Electricity Authority headquarters. Mr. Cotsworth is at present with Messrs. Merz & McLellan at their Esher, Surrey, offices.

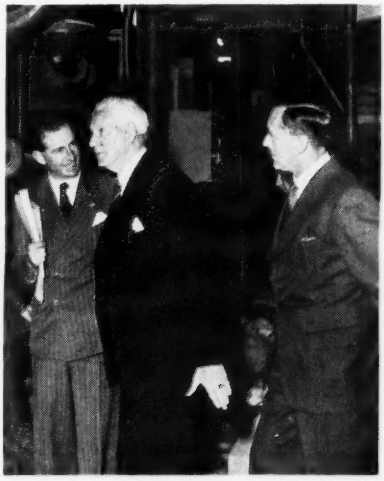
The *Manchester Guardian* reports that the Manchester City Council and the Council of Manchester University will be asked at their next meetings to approve the appointment as principal of the Manchester College of Technology of **Dr. B. V. Bowden,** who is now in charge of digital computers at Ferranti, Ltd.

Mr. O. L. Ritchie, A.M.I.E.E., A.I.H.V.E., sub-area assistant commercial officer, has been appointed sub-area commercial officer, No. 4/5 Sub-Area of the Merseyside and North Wales Electricity Board, in succession to **Mr. T. R. Smith,** A.M.I.E.E.

Mr. Ritchie received his technical education at Liverpool Central Technical College and his practical training with the Birkenhead Corporation Electricity Department. In 1937 he joined the Hull Corporation Electricity Department and was appointed to the Mersey side and North Wales Electricity Board in 1949.

Mr. O. L. Ritchie

Lord Citrine (centre) inspecting the turbine house of the new East Yelland (Devon) power station. With him are (left) Mr. D. A. Pask, resident engineer for construction and (right) Mr. D. Macleod, the station superintendent



Mr. H. J. Randall in the garden of his home at Woking, Surrey, with the trophy awarded to him for his prize Iris

We recently referred to the success of **Mr. H. J. Randall,** chairman of the London Electricity Board, at the British Iris Society's show. Mr. Randall has made horticulture a hobby for many years and last year won the Dykes Medal, the highest award an iris grower can obtain. In the accompanying picture Mr. Randall is seen in the garden of his home at Woking, Surrey, with the trophy he won this year at the British Iris Society's show.

At the **B.E.A. Training Establishment** at Horsley Towers, about 2,000 visitors attended a garden fête on 27th June. It had been organized for the Electrical Industries Benevolent Association by the Horsley Towers Club and the Surrey Committee of the E.I.B.A. Lord and Lady Citrine were among the guests and Lady Citrine presented the prizes. The staff of the London, Southern, and South Eastern Divisions, the London, Southern and South Eastern Electricity Boards and British Electricity Headquarters all combined to make the fête a great success both financially and socially.

Last week we made brief reference to the golden jubilee celebrations of **Barnett & Soans, Ltd.** We now reproduce a photograph taken on the occasion showing the directors and their wives who entertained about 200 employees and their wives from the company's seven branches. At the luncheon Mr. A. Gould, the managing director, was presented with an engraved silver salver, and the other directors with table cigarette lighters. Presentations were made to fourteen employees with over twenty-five years' service.

Mr. J. McGeary, who has been assistant secretary of the North-Eastern Centre of the Institution of Electrical Engineers for the past fourteen years, has resigned from that position.

Consequent upon the death, last February, of the founder director of Petbow, Ltd., **Mr. J. A. Peters,** there has been a reorganization of the company. **Mr. R. C. Bird** has been appointed managing director and **Mr. H. G. Puttick** technical director. Mr. Bird has been with the company since 1931 and was appointed a director in 1943. Mr. Puttick has been with the company since 1950. For the past two years he has been technical manager.

Dr. C. C. Garrard, M.I.E.E., who has been a director of the General Electric Co., Ltd., since 1943, retired from that position on 30th June. Dr. Garrard was born in 1877 in London and was educated at the Central Foundation Schools of London, Finsbury Technical College and the University of Göttingen. He became an engineer with the Nernst Electric Light Company in 1900 and in 1901 was appointed manager of the instrument and transformer department of Ferranti, Ltd. He went to the G.E.C. as manager of the company's switch and transformer works in 1908, becoming joint general manager of the Engineering Group in 1943 and resident director at the Witton works in 1946.

Dr. C. C. Garrard

Dr. Garrard is a past chairman of the I.E.E.

Left to right : Mr. and Mrs. W. G. Barnett, Mr. and Mrs. A. Gould, Mr. and Mrs. J. R. Soans and Mr. and Mrs. G. A. Gould

South Midland Centre and a past member of the I.E.E. Council; he was awarded a Paris Premium by the Institution for a paper on standardization. He has served on a number of E.R.A. committees and he is the author of a book on "Electric Switch and Controlling Gear."

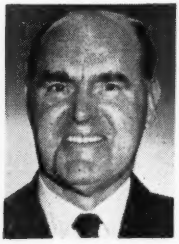
The annual outing of the **Bestfrend Electrical Co., Ltd.**, was held last week-end when for the second successive year a visit was paid to Paris.

Mr. Frank Linley, A.M.C.T., A.M.I.E.E., mains engineer in the North Western Electricity Board's No. 1 (Manchester) Sub-Area, has been appointed purchasing officer to the Board. He succeeds **Mr. James Mills**, who has been appointed manager of the No. 7 (Stockport) Sub-Area. Mr. Linley is forty-nine. He joined the Manchester Corporation Electricity Department in 1923, after experience with the Armstrong Whitworth and Crossley motor companies. At Manchester he held various positions before being appointed chief assistant mains engineer in 1944. Upon nationalization he became sub-area mains engineer for the Board's No. 1 Sub-Area.

Mr. F. Linley

OBITUARY

Mr. S. G. Rattee.—We record with great regret the death on 27th June of Mr. Stanley G. Rattee, A.M.I.E.E., the editor of the *Electrical Journal*. Mr. Rattee was born in London and from 1912 to 1921 served in ships, his service including the 1914-18 war period when he was concerned with radio communication.



The late
Mr. S. G. Rattee

From 1923 to 1926 he was one of the editors responsible for the publications of Radio Press, Ltd., and as such his name became very well known in the radio industry. In 1927 he became assistant editor of the *Electrician* (as the *Electrical Journal* then was) and he was appointed editor in 1940. In this position he was also in charge of a number of well-known directories. Mr. Rattee will be sadly missed by his colleagues of the electrical Press, who extend their sympathy to Mrs. Rattee and their son and daughter.

Mr. A. F. Bock, who retired last September from the post of Birmingham manager to the Metropolitan-Vickers Electrical Co., Ltd., died suddenly on 21st June at his home at Sutton Coldfield. Mr. Bock, who had been with the company for forty-five years, went to the Trafford Park works in the early days of British Westinghouse, and after serving a college apprenticeship from 1907 to 1910, he joined the Plant Department. He served in the 1914-18 war, rising to the rank of captain. Mr. Bock returned to the Plant Department after the war, and towards the end of 1921 went to South America; he was stationed at Valparaiso and represented the company in Chile and Peru during the next four years. On his return to this country he was attached to the company's London office, and was appointed manager of the Birmingham office in 1926.

The late
Mr. A. F. Bock

WILLS

Mr. R. Wingrave, founder of the Wholesale Battery Company, Luton, in 1926, who later opened Electricity House, Luton, died on 21st March leaving £19,123 gross (£19,004 net).

Mr. W. A. Cather, formerly of Cable & Wireless, Ltd., who died on 4th March, left £32,658 gross (£32,509 net).

Sir Gilfrid Gordon Craig, late director of Cryselco, Ltd., who died on 5th April, left £77,234 gross (£77,094 net).

Information Department

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"Sydney" washboilers.

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Power Station Costs

"REFLECTOR," in his remarks in your columns of 5th June to my earlier letter, sees fit only to express a personal impression but does not endeavour to justify the validity of his remarks. He would like me, though, to do this in every article or letter I write. His method, therefore, could leave him in the most advantageous position. I am quite willing, however, to give chapter and verse for my opinions, although in order to do this whilst at the same time not making any excessive demand on your space, I will limit my remarks to the question of manufacturing costs.

On the factors affecting the price of capital equipment for the supply industry, I will raise two relevant points. Firstly, amicable discussions may have alleviated the "fears" between the B.E.A. and B.E.A.M.A. acting on behalf of the suppliers of equipment, but they have not solved the quasi-monopoly price now being charged or the fears of the public and the employees in the industry concerning what is happening. It is not possible to advance one day the superficial economic theories supporting the wages-prices spiral and the next day ignore the economic repercussions of that theory, because if the price index outsteps the wages index when practically all costs are incurred within our national economy, then somebody is taking an unreasonable opportunity to charge too much.

This situation is shown more clearly statistically in the report on the first post-war iron and steel development plan (very analogous to electricity supply) where the price index for capital equipment has risen from 1945 to 1952 annually as follows: 100, 109, 121, 139, 142, 152, 179, 203; this is against a building wages index rise of 100, 118, 120, 130, 133, 135, 145, 157 and an engineering wages index rise of 100, 106, 108, 109, 113, 115, 126, 137. Neither must one forget the increase in productivity which will actually decrease the labour cost per unit produced.

On the second point "Reflector" quite rightly refers to power station costs being dependent upon both labour costs and material prices, but he must not forget that the raw material prices of one industry are the finished product of another. I, therefore, for my part did not err in stating that, whereas with power station construction the cost of those basic raw materials which are imported, represents only a very small item in final costs, the values added all the way along the line are those added by British labour employed to fashion them to the forms we want.

The exact points at which the blame may lie for excessive costs is not my concern, but the final price charged in relation to the general level of wages is.

Hayes, Kent. W. C. STEVENS,
General Secretary,
Electrical Trades Union.

Those Early Stations

THE article by Mr. W. E. Warrilow, M.I.E.E. (12th June, p. 1375), and the letter from Mr. John W. A. Mann (19th June, p. 1415) on the above subject have prompted me to peep into the past. The older stations were not all used for public lighting purposes as some private firms were early in the field with electric power and lighting installations and the following short description of a plant I was running in 1898 may be of some interest to many of your readers.

The generating plant consisted of two 2-pole Crompton d.c. dynamos, each with an output of 120 A at 500 V at 650 r.p.m. Each dynamo was driven by a pair of horizontal steam engines, having 14in dia cylinders with a 28in stroke and belt drives through a countershaft. This installation was at a colliery in Notts. and provided power for motors and lighting.

There were five motors, the largest being 60 h.p. and the smallest 6 h.p. The whole of the motors were of Crompton make, 2-pole open pattern with exposed

commutators and brushgear. This, I think will startle some of our mining electrical engineers of to-day. The motors were used for driving about 12 miles of haulage ropes.

The lighting installation consisted of about 160 lamps, 16 c.p. carbon, on the surface works and also at each motor position down the mine. Generally, the lighting wiring was carried out with four lamps in series on the 500 V mains but in the engine room, where the voltage was kept up to 500 V or a little over, there were five 100 V lamps in series, a series set being connected from each dynamo.

I had six attendants on the job, one in the generating station and one at each motor and very little trouble was experienced with the plant.

Bradford. HARRY MOSS.

I WAS particularly pleased to read Mr. Mason's letter on my article on the above subject and while thanking him for his offer to lend me R. H. Parsons' book "Early Days in the Electric Light Industry," I would say that this work inspired my I.E.E. talks and also provided me with a number of most interesting slides. I borrowed the volume from the I.E.E. Library and like Mr. Mason would strongly recommend its perusal to the present generation of power station engineers.

I first met Parsons at Ferranti's at Hollinwood in 1902 and later when I joined the *Electrician* and he was on the staff of *Engineering* we kept up our old friendship. For some time he was city electrical engineer of Edmonton, Alberta, and I well recall his vivid account of the "drowning" of the station after heavy rains and how they kept going until the rising waters reached the commutators of the d.c. generators !

W. E. WARRILOW, M.I.E.E.

Bournemouth.

Metrovick War Memorial

A BOOK of Remembrance containing the names of Metropolitan-Vickers employees who gave their lives during the 1939–45 war has been placed in the entrance to the company's main offices at the Trafford Park Works, where it lies on an illuminated desk surmounted by a bronze sword. A page of the book will be turned over every day. The Memorial was unveiled by Dr. I. R. Cox, D.S.O., managing director, on 22nd June, and this ceremony was

Dr. I. R. Cox (left), Metrovick managing director, standing by the War Memorial

followed by a short service of dedication conducted by Canon J. C. McCormick, Rector of Stretford. Those present included representatives of all the employees of Metrovick, and on their behalf Dr. Cox laid a wreath at the foot of the Memorial.

Television Plans

AN outline of the B.B.C.'s plans for developing the television service was given last week by the Director-General, Sir Ian Jacob, who emphasized that the completion of the whole in the next nine years would depend upon the resources being made available to the Corporation, and the relaxation of restrictions on capital expenditure.

He said that when the five medium-power stations now planned were completed—it was hoped by the end of next year—90 per cent of the population would be within effective reach of the television service. The next step would be to complete national coverage (within about four years) by rebuilding the London station with higher power and erecting eight low-power stations in the Channel Islands, Isle of Man, East Anglia, S.E. England, West Wales, Cumberland, Inverness and Londonderry. About 97 per cent of the population of Great Britain would then be covered.

The time would then be ripe for the development of an alternative service by a second chain of television stations. At some point in the ten-year plan it might be possible to introduce colour.

Contractors' Conference

Final Session at Bournemouth

PROCEEDINGS at the Bournemouth Conference of the Electrical Contractors' Association concluded on Wednesday afternoon last week with the presentation by Mr. W. H. Smith, O.B.E., of his paper on "Electronics and Contracting," the installation of the new President, and the winding-up of the conference by this year's President, Mr. W. T. Trace.

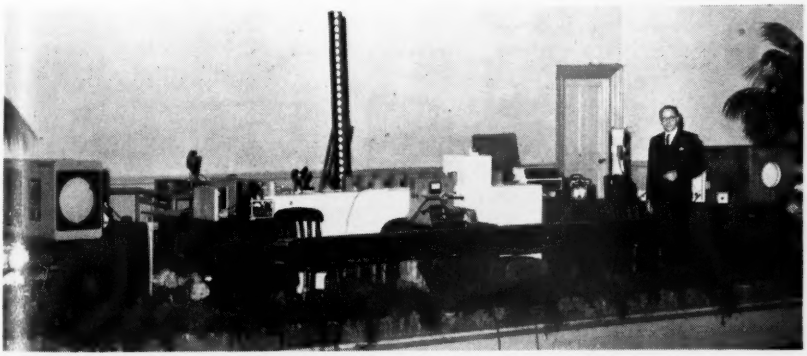
After giving a précis of his paper Mr. Smith exhibited a Walt Disney film used by the United States Army Air Force for instructing its members in the basic theory of electronics. The delegates found this highly entertaining as it combined humour with tuition. Mr. Smith then proceeded to demonstrate a number of applications of electronics in different spheres. Among other equipment he showed an oscilloscope and its response to different frequencies and amplitudes, a sorting bridge, a metal detector, a photo-electric counting device, an electronic balancer and a Geiger counter.

Because of lack of time the "discussion" had to be curtailed. In fact there was only one speaker, Dr. R. C. G. Williams (Philips Electrical, Ltd.), and a brief reply by the author. Dr. Williams said that Mr. Smith had directed the contractors' attention to a new field and an important one in the aim to improve productivity. The industrial lead secured by America was attributable largely to the greater use of electronic devices there. He warned the contractors that if they wished to play any prominent part in the electronic equipment of factories they would have to get to know more about very high frequencies. These introduced phenomena quite different from those to which the contractors were accustomed in their low-frequency work. Impedance became very important; pure resistance was often negligible and inductance and capacity were the effective quantities. If they did not possess the necessary knowledge themselves they would have to engage expert staff.

Dr. R. C. G. Williams

Mr. Smith agreed with Dr. Williams's remarks and suggested that one way of ensuring success would be to have a good

Mr. W. H. Smith's demonstration of electronic apparatus



Mr. S. L. M. Barlow acknowledges his election as President

apprentice in his last year instructed in the subject.

The President thanked the author for his paper and then re-introduced the Mayor of Bournemouth and expressed the Association's appreciation of the hospitality and assistance which Bournemouth had extended to them. He also thanked all those who had helped to make the Conference a success with special mention of Mr. Eric Grace, chairman of the E.C.A. Bournemouth Branch, Mr. Norman Aish, the secretary, and other members of the branch who had acted as stewards.

After the Mayor had responded and taken his leave, Mr. Trace introduced his successor as President, Mr. S. L. M. Barlow. He said that Mr. Barlow had been vice-president for the past year. During the post-war period he had been chairman of the London Branch and of the London and Home Counties Sectional Board and he was chairman of the Association's Technical Committee. Mr. Trace said that he had no doubt of the wisdom of the Council's choice and then invested Mr. Barlow with the badge of office.

Mr. Barlow, in expressing his gratitude for the members' confidence, said that Mr. Trace had been an outstanding President, conducting the Association's affairs with great skill, wisdom and friendliness. He regretted that neither of the two senior vice-presidents (Mr. J. R. Halliwell and Mr. A. F. Plummer) had found it possible to take office this year. Mr. Barlow said that he had always believed in the Association; with its long and successful history it had formed a pattern for others.

As reported last week, the last function of the Conference was a smoking concert and dance at the Pavilion.

New Types of Vacuum Pumps

THE concept of obtaining high vacuum by ionization is quite old but two new pumps making use of this principle are described in the May issue of the *Review of Scientific Instruments*, one of the publications of the American Institute of Physics. In one article Helmut Schwarz (Centro Brasileiro de Pesquisas Físicas and Universidade do Brasil, Rio de Janeiro, Brazil) gives calculations on the possibility of obtaining high vacuum in an electrical discharge.

He shows that in a simple d.c. gas discharge practically no real pumping action is possible; in such a discharge only clean-up, i.e. electrical adsorption, may be observed. A real pumping action only results if it is possible to get within a tube such a high ion current by special arrangements that the number of ionized gas molecules transported with this current in one direction is greater than the number of gas molecules that will diffuse back in the opposite direction. An electronic high-vacuum pump of real pumping action has been built; it starts pumping at about 10^{-3} mm Hg and gives an ultimate pressure lower than 5×10^{-6} mm Hg.

Another vacuum pump described in the same issue by John S. Foster, Jr., E. O. Lawrence and E. J. Lofgren (Radiation Laboratory, University of California, Berkeley, California) is based on the properties of a magnetically collimated electric discharge. It has a speed in the range 3,000 to 7,000 litres sec and a base pressure of the order of 10^{-6} mm.

Amalgamation of Districts

THE Clydebank and Scotstoun Districts in the South West Scotland Electricity Board's Clyde Sub-Area are being amalgamated. The office of the combined District is situated at 2385, Dumbarton Road, Glasgow, S.4, the district engineer being Mr. J. McIntosh, Associate I.E.E., and the district commercial engineer, Mr. A. M. Korn, A.M.I.E.E.

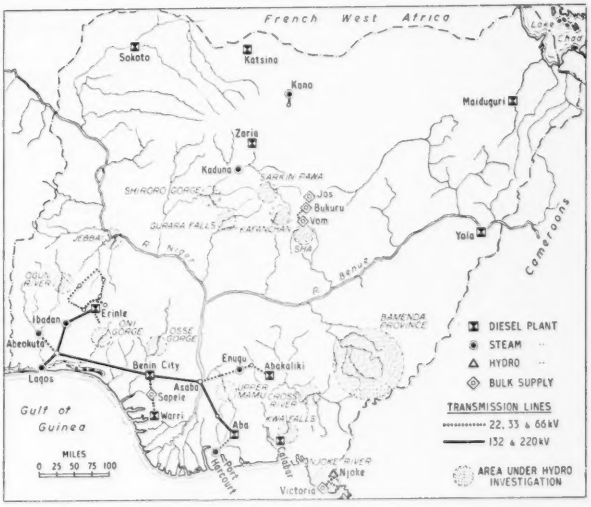
Plan for Nigeria

Pithead Generation to Avoid Transport Costs

ALTHOUGH an electricity supply first became available in Nigeria as long ago as 1898, subsequent development has been on a small scale, and in 1950 consumption per head of the population was only 4 kWh. In that year the Electricity Corporation of Nigeria was established and on 1st April, 1951, it took over the operation of the Government electricity undertakings. These were all found to be running at a loss and were in a poor state of repair, breakdowns and curtailment of supply being frequent. Mr. J. Houston Angus, the chairman, speaking at the Corporation's annual meeting when its first report was presented, explained that this was primarily due to lack of staff and implied no criticism of those who had worked hard to keep the undertakings going. The Corporation itself has continued to experience similar difficulty, an extensive recruiting campaign producing disappointing results.

Ultimately it is visualized that a cheap supply of power will be provided by developing the country's hydraulic resources (chiefly of the River Niger and in the Cameroon Highlands) when industries have been established capable of absorbing large quantities of power. Apart from semi-bituminous hard coal mining centred on Enugu, a good quality lignite has recently been proved in the neighbourhood of Asaba and other deposits exist in the north. Lead-zinc deposits are likely to be exploited around Abakaliki and iron ore has also been found there as well as in the Bamenda Province. A proposal to erect a cement factory near limestone deposits in the Enugu area is being considered, while in the north pyrochlore deposits might form the nucleus of a fresh mining area for the production of uranium and colombite.

The largest project taken over by the Corporation is for a new power station at Lagos (Ijora " B "). An initial installation of two 12,500 kW sets was planned with two further sets of 25,000 kW subsequently. Trouble was, however, experienced with the foundations and revised recommendations were accepted for constructing the station on a buoyant raft and it was decided to confine operations to the first two sets for which contracts had been placed. A proposed steam station on the River Emene at Enugu (two 5,000 kW sets have been ordered) was moved to a new site on the River Oji. Work is proceeding



Map showing the nature of the interconnection proposed

on the installation of steam turbines and boiler plant at Ibadan, Kano and Port Harcourt and diesel plant at a number of places.

During the year 1951–52 the Corporation generated or purchased (from the Cameroons Development Corporation, the Nigerian Electricity Supply Corporation, Ltd., and the African Timber & Plywood Co.) 78·3 million kWh, an increase of 30 per cent on 1950–51, the number of consumers rising from 31,310 to 36,939. The lowest generation cost was at Enugu (1·271d/kWh sold) and the highest at the diesel plant at Yola (11·437d). The average price received per kWh sold was 2·760d, but tariffs are being revised to balance expenditure.

In considering the future of the electricity supply industry the Corporation has been faced with the comparatively high price of hard coal and the cost of transporting it to the power stations (last year the coal costs ranged from 37s 3d a ton at Enugu to 96s 6d at Ibadan). The technical and economic aspects of pithead generation from mechanically mined lignite, combined with high voltage transmission, have therefore been the subject of special studies. Establishment of a station with an initial capacity of 90,000 kW at Asaba (in the lignite area) is contemplated if the economic study confirms the technical findings. A major interconnection at 220 kV would be made from Asaba to Shagamu, 132 kV connections from there to Ibadan and Lagos, and 33 kV connections to Ijebu-Ode and Abeokuta. Later, a second 220 kV circuit between Asaba and Shagamu is envisaged with an extension to Lagos and the erection of 132 kV lines to Abakaliki and ultimately to Port Harcourt. At Ibadan connection would be made at 132 kV with a 33 kV system linking Oshogbo, Ilesha and other places.

For such a system, together with pithead generation for the eastern and western systems and schemes to meet the individual requirements of the northern cities, a sum approaching £40 million would be required by 1960, much of which, the report states, would have to be raised in Nigeria. So far the Nigerian Government has advanced to the Corporation sums totalling £2,900,000 for capital development at 3½ per cent interest and has relieved it of its obligation to provide amortization for a number of years. The amount of capital promised to the Corporation to date amounts to £10·75 million. Of this £6·25 million is in respect of the Corporation's interim programme, for the years 1952 to 1956, while £4·5 million is to be provided for the completion of those Government projects under way at vesting date. It is stated that the latter sum may be up to £1·25 million short of requirements as the costs of the civil engineering works are much higher than provided for in the original Government estimates. With the capital at present available no extensions of supply can be envisaged other than those already accepted for Benin, Onitsha, Oshogbo-Ede and Ijebu-Ode.

The report refers with regret to an explosion which occurred at Port Harcourt power station in November, 1951, when six men were killed and nine injured.

Indian Power System

STATISTICS published by the Central Water and Power Commission (Power Wing), Simla, show that the total electricity production in India during 1952 was 6,125 million kWh. Of this, 50·6 per cent was generated by steam stations, 45·9 per cent by hydro plants and 3·5 per cent by diesel plants. Compared with the previous year's production of 5,858 million kWh, the 1952 figure represents an increase of 4·6 per cent.

A fuller review of power supply in 1951 gives the total number of undertakings as 585 of which 24 owned stations producing over 91 per cent of the total output. Five private and 26 municipal undertakings in Madras State, two private undertakings in Madhya Bharat and one company-operated undertaking in Punjab(I) were taken over during the year by their respective State Governments. The installed capacity of public supply undertakings at the end of the year was 1,835,000 kW (1,097,000 steam, 575,000 hydro and 163,000 diesel) in 514 stations. The number of consumers was 1,678,000. Consumption per head of the population averaged 13 kWh per annum and in the various States ranged from 0·35 kWh (Orissa) to 68·6 kWh (Delhi).

A summary of the progress made on the principal development schemes in hand mentions the starting up earlier this year of the first two 50,000 kW sets at the Bokaro thermal station (Damodar Valley Corporation); a third set is nearly ready. This is stated to be the largest steam station in India and is designed to utilize low grade coal with an ash content up to 30 per cent.

I.E.E. on Tyneside

Summer Meeting at North Eastern Centre

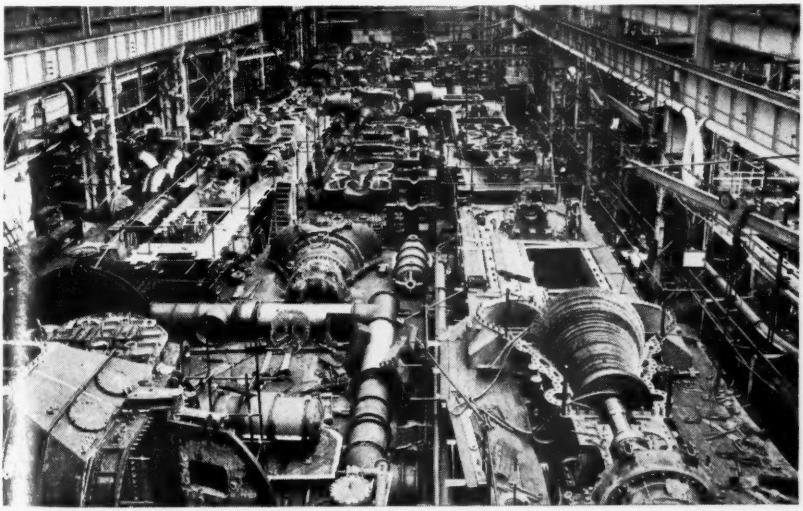
IT is a quarter of a century since a summer meeting was last held on Tyneside by the Institution of Electrical Engineers. Participants in this year's event (29th June to 3rd July) under the presidency of Col. B. H. Leeson, O.B.E., foregathered as before on the Monday evening for an informal reunion, with music and light refreshments, at the Royal Station Hotel, the headquarters. There a cordial welcome was extended to the visitors by the Lord Mayor of Newcastle-upon-Tyne and the chairman, Mr. H. Leyburn, and Committee of the North Eastern Centre, the establishment of which dates from 1899.

The area is renowned chiefly for the mining and export of coal and for shipbuilding so that visits to both collieries and to shipyards were naturally included in the itinerary which also took in a number of engineering works. The locality was early associated with the introduction of steam railway traction and with the invention of the Parsons steam turbine, while it was at Newcastle that electric lighting on a large scale by means of incandescent filament lamps was publicly exhibited by Sir Joseph Swan for the first time.

But, apart from local industrial aspects and the historical remains extant, the Centre is, too, within easy reach by road of some of the most picturesque parts of the kingdom, as participants in the meeting learned from excursions to Hexham Abbey and the Roman Wall, including the camps at Borcovicus (Homesteads) and Corstopitum (Corbridge); Durham's lovely cathedral and a tour of the county; the coast castles of Northumberland (Warkworth and Alnwick); an excursion to Kielder Forest and the Border Country; and a trip down the river on one of the Tyne Improvement Commissioners' launches.

Among those who were hosts at luncheons or teas during the meeting were Messrs. Merz & McLellan, the North Eastern

Large steam turbo-alternator erecting shop (*Parsons*)



Electricity Board, the North Eastern Division, B.E.A., and the National Coal Board. There was a dinner-dance at Durham Castle during which access to the Fellows' Garden was kindly given by Lt.-Col. A. A. Macfarlane Grieve, who is Master of University College, University of Durham. The meeting ended officially on the Thursday evening with a dinner and dance at the Old Assembly Rooms in Newcastle-upon-Tyne, which commenced with a reception by Col. B. H. Leeson and Mr. H. Leyburn, and their ladies, but for members who wished to remain for another day optional sightseeing all-day excursions were arranged.

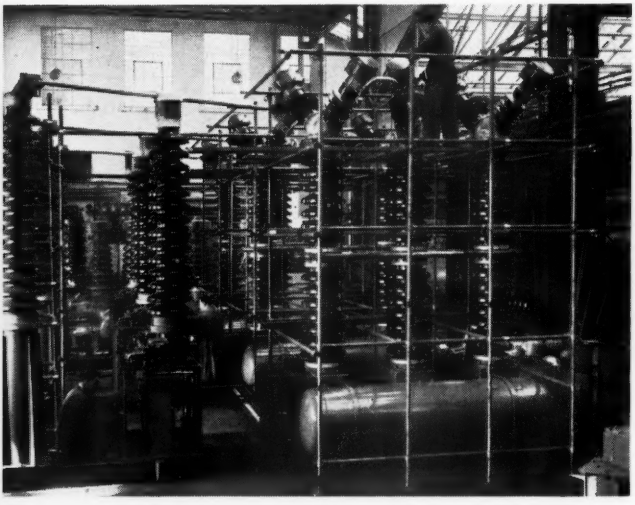
Alternative morning or afternoon tours of more than a dozen works in the area during the meeting included visits to the Heaton works of C. A. Parsons & Co., Ltd., which during their sixty-four years of existence have been enlarged from 2 acres and 48 employees to 55 acres and nearly 6,500 persons. The company produces nearly 1,000,000 kW of turbo-alternators a year and 2,000,000 kVA of transformers. The entirely new pipe division, comprising three large shops, is self-contained with its own design and drawing office, fabrication, welding and machine shops and outside erection department.

The factory of A. Reyrolle & Co., Ltd., is divided physically into two sections by the Newcastle to South Shields electrified branch railway line. At the New Town Works on the south side all the machining and fabrication of new materials is done, while the Hebburn Works is devoted essentially to the sub-assembly of switchgear parts and to the final assembly of the switchgear. The visitors were received at the New Town Works in the building housing the new a.c. network analyser which the company has installed mainly for the study of power system problems. It is of conventional design, but has several novel features, including an automatic mimic diagram and check-metering arrangements; also, the base frequency (1,592 c/s) is much higher than usual, and will permit study of some higher-frequency phenomena like rates of rise of restriking voltage. The visitors then went through the three large shops comprising the New Town Works where they witnessed examples of up-to-date machining and the fabrication and welding of a variety of basic units for switchgear.

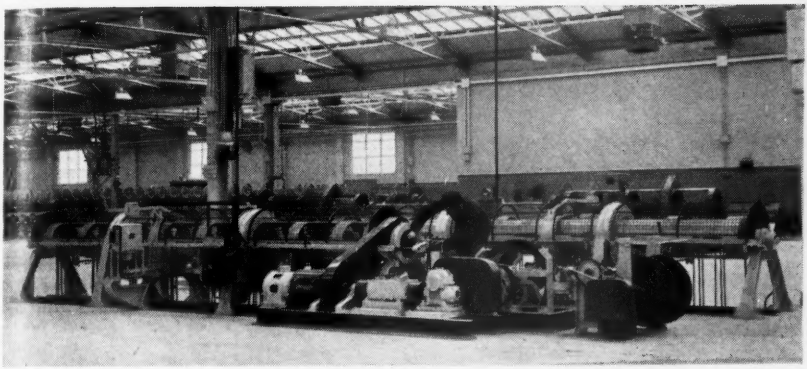
At the Hebburn Works switchgear of all types and ratings up to 275 kV were seen in course of assembly and typical examples of finished panels had been erected for inspection. Closing and opening demonstrations were given of two air-blast circuit breakers, one rated at 132 kV 3,500 MVA and the other for the new super-grid of 275 kV 7,500 MVA rating.

In the high-voltage laboratory various aspects of testing and research were shown, including heavy-current heat tests, Schering bridge testing, protective gear testing, and X-ray examination of insulation. There was also a demonstration of a wet 50 c/s power flash-over test of a 275 kV outdoor current transformer, using the 1,000 kV test transformer as well as an impulse flash-over on an insulator string from the 2,250 kV surge generator.

W. T. Henley's factory at Birtley, on a site of 5 acres, was opened in 1930



A 275 kV air-blast circuit breaker in course of erection (*Reyrolle*)



A battery of cable stranding machines at Birtley Works (*Henley's*)

and is a definite departure from the traditional lines usually followed in cable making. The main factory is a single-storey building, with a floor area of about 400,000 sq ft, equipped with modern machines.

Electricity is taken from the North Eastern Electricity Board's 20 kV ring main and transformed down to 240/415 V in three substations within the main factory building. The total installed capacity is 4,500 kVA. Individual drive is general, the size of motor ranging from fractional h.p. for small machines to 200 h.p. for large rubber mills. Electric heating is used for annealing, tinning, lead covering and in the canteen for cooking.

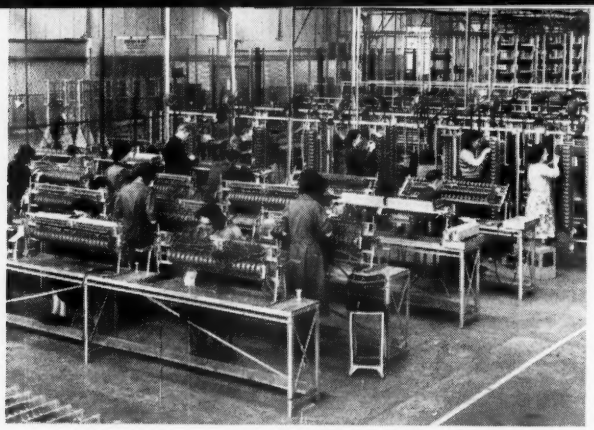
The General Electric Co., Ltd., purchased the Lemington Glass Works property in 1906, although the history of the works goes much further back. At that time the company was dependent on the Continent for its supplies of glass bulbs. A great variety of special shapes and colours of bulbs are still made at Lemington. Television tubes are being made there both by machine and manual methods while glass refractors for street and aerodrome lighting are also an important feature of the activities at the works. A notable landmark is the old brick-built cone, still standing, originally one of three commenced in 1797 and certainly the largest ever erected over a glass-melting furnace.

The general tour of the Newcastle factory of W. D. & H. O. Wills afforded an opportunity of seeing the principal manufacturing processes involved in cigarette making (see *Electrical Review*, 11th July, 1952, pp. 59–65) and such other items as the main substation, the two JV.12 Mirrlees diesel engines, refrigeration plant and boiler house.

The Tyne mill of Spillers, Ltd., completed in 1938, consists of two main buildings: one of them is a silo designed to store 150,000 qr of grain while the bottom five floors of the other building comprise the warehouse, above which is the flour mill and another in which cattle, pig and poultry foods are made; there is also a dog biscuit factory. Grain ships can be accommodated alongside in the river and the wheat is discharged at the rate of 2,000 tons a day by two pneumatic travelling suction plants, driven by two 180 h.p. motors. Among 300 motors of capacities ranging from 150 h.p. down to fractional sizes, the most important is a 800 b.h.p. Parsons synchronous induction machine which rope-drives the flour mill. Electricity is employed for the control of various processes, the packing and automatic weighing of finished products and for counting.

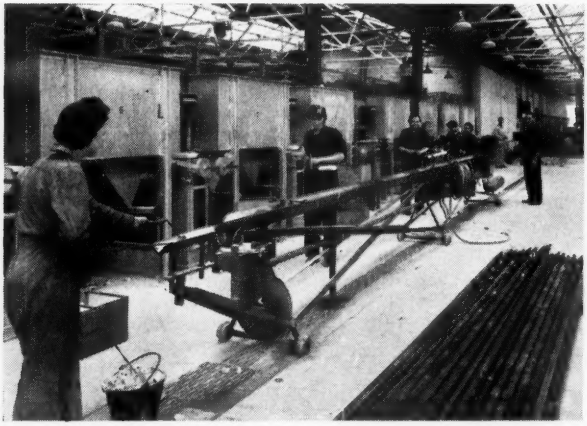
Siemens Brothers & Co., Ltd., took over in 1945–46 factories at Spennymoor, with a working space of some 200,000 sq ft, and at West Hartlepool, with a total floor space of 335,000 sq ft. Some 1,600 workpeople are now employed at West Hartlepool on private telephone exchange systems and equipment for large public exchanges. The works also supplies the Spennymoor factory with telephone parts.

The Bushing Co., Ltd., was formed in 1929 for manufacturing condenser type bushing insulators for switchgear and transformers, which were formerly imported from the Continent. The present factory



Wiring of panel units of auto-telephone switching racks (*Siemens*)

Filling copper tube with red-hot insulating blocks taken from furnaces in background (*Pyrotenax*)



at Hebburn-on-Tyne is now a complete unit in that the whole process, from the basic raw materials to the finished article, including the making of the synthetic resin, takes place in the one establishment. The greater proportion of the company's output comprises bushings of the hard synthetic resin bonded paper type, but oil impregnated dry paper bushings and oil filled barrier type bushings are also manufactured. The voltage range of bushings under regular manufacture is from 11 kV to 300 kV; bushings for 330 and 400 kV systems are in an advanced state of development and factory extensions which will more than double the existing floor space are approaching completion. The new high-voltage laboratory will be equipped for 50 c/s testing up to 700 kV and for impulse testing up to 1,200 kV.

Pyrotenax, Ltd., makes mineral insulated copper covered cables. Copper tubes are filled with blocks of pure magnesium oxide, which are formed in presses and dehydrated in electric furnaces before copper rods, which become the core conductors, are threaded through holes in the blocks. A series of drawing-down and annealing processes finally consolidates the whole and reduces the finished cable to the required outside diameter. One, two, three, four and seven conductors can be incorporated and the cables will withstand up to 1,000 deg C, so that they will continue to operate in intense fires.

In addition to the N.E. Electricity Board's Herrington Burn substation, two of the B.E.A. North Eastern Division's generating stations and the sites of two others were toured. The Dunston station, on the south bank of the River Tyne some three miles west of Newcastle, comprises two distinct and separate stations. The "A" station, built in 1910, contains three 15 MW sets and also the experimental 15 MW gas turbo-alternator now in course of construction. The "B" station was commenced in 1933 and now has a capacity of 300 MW. In the older part of the station (known as "B I") steam is provided by 16 boilers whereas in the newer part (known as "B II") each set is associated with a single large unit boiler having a capacity of 410 klb/hr, steam conditions at the turbine stop valve being 600 lb/sq in and 850 deg F reheating to 850 deg F. This new plant

achieved the distinction of being the most efficient in the country in its first year of operation.

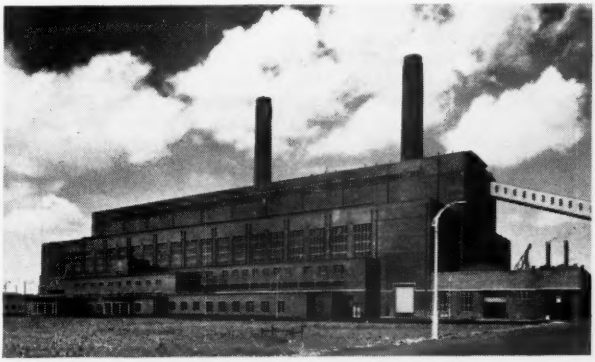
There are three boiler houses: one is stoker fired and the second is pulverized fuel fired, both these being associated with the earlier plant, while the third houses the two large unit boilers to which we have referred. Dunston "B" is one of the largest stations operating on the reheat cycle; it is also unusual in its use of glass instead of brick walls.

The North Tees power station is at Billingham on the left bank of the Tees opposite Middlesbrough, and comprises three sections. The "A" and "B" sections are at the northern end of the site; "A" contains 20 MW sets and appropriate boiler plant installed in 1921 while "B" has one 20 MW and two 25 MW sets and associated boilers built in 1923, later extended by the addition of the p.f. boiler house containing two 180 klb/hr boilers.

The new "C" section, shortly to be completed, will contain four 60 MW turbo-alternators and seven 360 klb/hr pulverized fuel boilers. The turbines are three-cylinder machines running at 3,000 r.p.m. and the alternators are hydrogen cooled. The output is generated at 11 kV, stepped up to 66 kV and switched at that voltage in the main switchhouse some distance away from the power station. There is no separation between the turbine and boiler houses. North Tees was the first station to employ the reheat cycle (on the old plant), although the new plant in "C" section is operated on the "straight" regenerative cycle, with steam at 900 lb/sq in and 925 deg F.

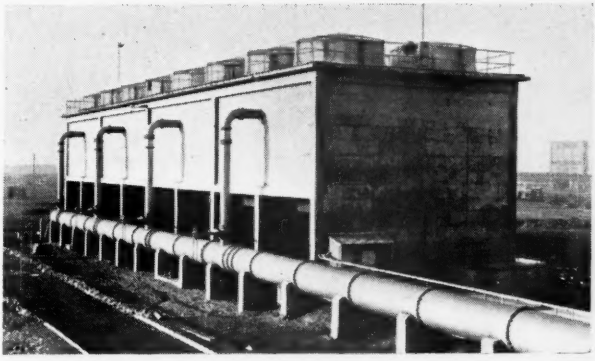
Of the two plants owned by Imperial Chemical Industries, Ltd., that were visited, the Wilton Works is the vast undertaking started on Tees-Side in 1946 with the intention that the site should provide room for expansion and further development by any of the firm's ten manufacturing divisions. The chemical plants are owned and operated by the divisions, while the common services (electricity, water, transport, workshops, etc.) are provided by the Wilton organization.

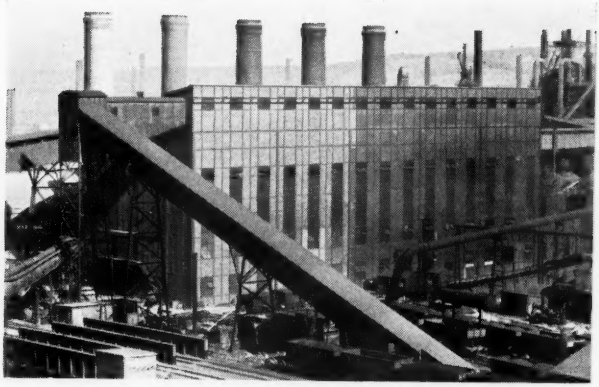
Proximity to the existing I.C.I. factory at Billingham, Co. Durham, made possible the construction of the ten-mile pipelines which, through the specially constructed Tees Tunnel, carry gases and liquids between the two factories. The site is supplied with electricity from its own power station (*Electrical Review*, 12th December,



Exterior view of North Tees "C" power station (*N.E. Division., B.E.A.*)

Power station water cooling tower at Wilton Works (*I.C.I.*)





Extension of the Cleveland Works boiler house, with a blast furnace in background (*Dorman Long*)

1952) which was designed primarily to provide steam for chemical processes and space heating, but the adoption of high steam pressures has enabled electricity to be generated economically as a by-product; the present installed capacity is 60,000 kW.

Owing to its great size, the site is being developed in stages, each taking about five years to complete, and manufactures already established at Wilton include synthetic plastics and moulding powders; an oil cracker has been in operation for many months, as well as plants to consume the ethylene which is its main product. Notable among the plants now under construction is that for the manufacture of the new synthetic polymer, "Terylene," and for spinning it into continuous filament and staple fibres.

The Cleveland Iron & Steel Works, the largest in the Dorman Long group, is fully integrated, possessing coke ovens, blast furnaces, steel furnaces and rolling mills. The works cover about 670 acres with modern wharves and ore discharging appliances on the estuary of the River Tees. Two batteries of 68 Simon Carves underjet compound regenerative coke ovens are arranged for clean blast furnace or coke oven gas firing. Three blast furnace plants comprise a total of ten stacks and two steel plants serve the Cleveland mills.

The No. 6 mill is a two-stand reversing type driven by two 3,200 h.p. reversing motors, the 40in cogging reversing mill has sideguard manipulators driven by a 16,000/17,000 h.p. reversing motor, while No. 7 is a three-stand, three-high mill with roughing and intermediate stands driven by a 3,000 h.p. motor and a finishing stand powered by a 1,200 h.p. motor; No. 8 is a light section mill and has a roughing mill comprising two three-high stands with automatic rolling, driven by a 1,200 h.p. motor; the finishing mill has five three-high stands, three of which are driven by a 1,000 h.p. motor and two by a 400 h.p. motor.

Since the war new boiler plant has been installed: five Thompson units, each of 100,000 lb/hr at 450 lb/sq in and 725 deg F. They are fired with blast furnace and coke oven gas and ore, coal and coke breeze on chain grate stokers. In the power house are eight turbo-blowers and four generators, three 50 c/s and one 60 c/s, of 10,000, 7,500, 5,600 and 6,000 kW capacity; three generate at 11 kV and the smallest at 2·5 kV.

The Redcar Iron and Steel Works came into production in 1920 and comprise blast furnaces, open hearth steel plant and rolling mills. They are on the south bank of the River Tees estuary immediately to the east of the new Dorman Long Lackenby development area, the main product being rolled steel plates. There are two blast furnaces and practically the whole of the iron output is absorbed by the open hearth steel plant. In 1947 oil firing of the steel furnaces and mixers was introduced.

The main plate mill has two stands with rolls driven by a reversing electric motor of 20,000 peak h.p. The smaller mill, the only one of its kind now operating in this country, is a universal type which rolls the edges of the plates so as to avoid the need for side shearing.

Also at Redcar works is a welding department which turns out cylindrical frames for electric motors and generators by the pressing to shape and welding of rolled steel plates; these shops have been recently extended.

The Bridge & Constructional Works has a covered area of 480,000 sq ft and a

potential output of up to 60,000 tons of riveted and welded structural work per annum.

The name of Clarke, Chapman & Co., Ltd., has long been associated with the manufacture of steam and electric ships' deck and engine room auxiliaries; the company also specializes in water-tube boilers and ancillary plant for power stations.

Sir Charles Parsons, when a partner from 1884 to 1889, conducted some of his initial turbine experiments in an old mansion which is now the company's Reflector Department. The Sunbeam Lamp Co. was formed in 1887 to manufacture early electric lamp bulbs, the partners being William Clarke, A. H. Chapman and the Hon. C. A. Parsons, all of whom were at that time partners in Clarke, Chapman & Co. Meanwhile the firm made, in 1884, its first generating plants for lighting in Admiralty vessels, and it now also makes pumps, heaters, condensers and boilers and Raymond mills for coal pulverizing.

Among the main items seen on test were two 5 ton winches supplied from a dual output generator, the latter being driven by a three-phase 50 c/s squirrel cage motor. The salient feature of the system is that the a.c. is taken right up to the m.g. set and converted locally to d.c. The generator differs from the ordinary Ward-Leonard generator in that it is capable of supplying independently and simultaneously two separate winches. Two W.-L. generators are therefore telescoped into a single unit which in construction is very similar to an ordinary four-pole d.c. machine, having a standard armature with a single commutator but, due to the special field winding, two opposite pairs of brushes can provide independent power supplies.

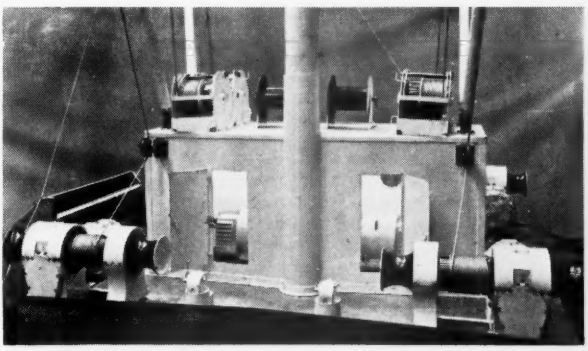
The Neptune works of Swan, Hunter & Wigham Richardson, Ltd., on the north bank of the Tyne, comprise shipyard, engine works and boiler shop. The shipyard is undergoing reconstruction to enable advantage to be taken of prefabrication to reduce the time taken in erection of the ships on the berths.

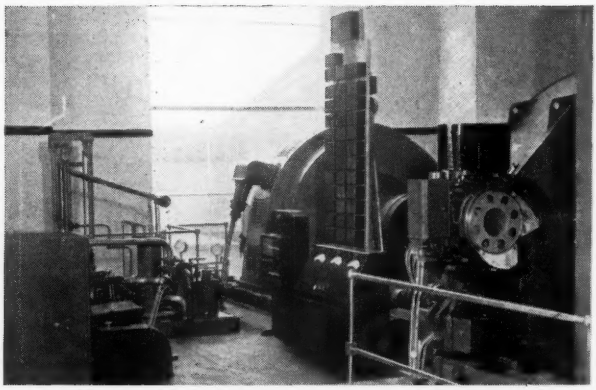
The engine works is working to capacity on the manufacture of marine oil engines, low pressure geared turbines and steam engines of all types. The boiler shop, which has been recently modernized, is engaged on the construction of Scotch marine, water tube, waste heat and composite types, as well as a large number of special boilers for water-gas installations.

Since the war an ambitious scheme of modernization has been completed at the Walker (Newcastle-upon-Tyne) Naval shipyard of Vickers-Armstrongs, Ltd., involving both the steelworking and fitting-out sections, to enable hull structures to be erected in prefabricated parts, which are made up of welded and/or riveted structural units. Of the seven slipways that were retained after rearrangement of the site, the largest is capable of accommodating vessels up to 1,000ft long, the width of the berth being 140ft. The old d.c. welding network was replaced by an a.c. network to permit the construction of all-welded ships on all slipways. An X-ray laboratory controls the quality of welding of hull structures.

The new Havannah drift mine of the National Coal Board, Northern (Northumberland and Cumberland) Division, is about a mile west of Hazlerigg Colliery which is 5½ miles north of Newcastle-upon-Tyne. It is planned for an output of 1,500 tons (saleable) a day (won by intensive mechanized methods) for about 30 years from four seams. The area to be worked

Model of typical winch group drive with motor-generator set in deck house (*Clarke, Chapman*)





Lynemouth Colliery No. 2 winder showing Lilly controller, driver's instrument panel, A.T.M. signals, trip indicator, motor, servo apparatus, driver's seat and controls, and changeover switch (*National Coal Board*)

is about 900 acres and 860 men will be employed in two years' time.

Originally planned for mine cars with direct rope haulage, it was later decided to use cable belt haulage. The cable belt of 300 tons an hour capacity will be 36in wide and of 350 h.p., driven by a Bruce Peebles slip-ring motor at 250 ft/min. This belt, which is 1,815 yd long with a lift of 663ft and of a special type, will deliver into a hopper at the front of the main engine house which will also contain the man riding and materials haulage engine for the drift. A 36in belt conveyor of conventional design will elevate the coal from the hopper to an intermediary transfer point over the main sidings. Another 36in belt in an overhead gantry will carry coal to the temporary screening plant.

The main ventilation fan is of the "Aeroto" type made by Davidson and Co., Ltd., of Belfast. Power is received at 20 kV and transformed to 3,300 and 550 V. It is transmitted down the main drift at 3,300 V by a 0·15 sq in ring main cable.

When in 1934 the Ashington Coal Co., Ltd., decided to install an automatic a.c. winder at the Lynemouth No. 1 Shaft, no previous attempt had been made to overcome the difficulties of control presented by an a.c. winder using cages necessitating a decking sequence involving the use of keps, but it was successfully installed the following year by the Metropolitan-Vickers Co.

As part of the extensive development scheme at this colliery, the N.C.B. in 1949 placed an order for two further automatic a.c. winders, each of 1,225 h.p., for Lynemouth, one for No. 2 Shaft (which was to be enlarged and equipped for coal drawing and another to replace the original winder at No. 1 Shaft which was being transferred to Linton Colliery where it would be joined by a new 450 h.p. automatic winder. Finally two more 450 h.p. automatic winders were to be installed at Ellington Colliery, so that eventually there would be six automatic a.c. winders at this group of collieries. All are under construction or installation and the first to be fully commissioned, that at Lynemouth No. 2 Shaft, was available for inspection.

This winder has the latest form of dynamic braking while a unique feature is remote manual control from a position at the decking point where the banksman-cum-driver controls the ramming, tippling and the kep operations involved in the handling of the mine cars and initiates the automatic operation of the winding engine itself. For special duties, such as winding men when automatic control may not be desired, provision is made by the turning of a switch for the complete manual control of the winder from the same position. The winder can also be controlled manually from the winding engine house.

North East Electrical Club

A CLUB under the title of "The North East Electrical Club" has now been formed and the following have been elected officers:—Chairman, Mr. A. C. Bendall; vice-chairman, Mr. A. E. Dees; hon. secretary, Mr. L. Higson; hon. treasurer, Mr. W. Johnson; and hon. assistant secretary, Mr. J. Nielsen. A committee, representing as far as possible all sections of the electrical industry, has been elected and it is hoped to arrange an interesting series of papers for next winter and also a number of social events. Interested persons are invited to write to Mr. J. Nielsen, the hon. assistant secretary, 5A, Loraine Terrace, Church Road, Low Fell, Gateshead.

COMMERCE and INDUSTRY

Municipal Installation Contracts

Fuel Research Board's Report

TALKS have taken place between the Electrical Contractors' Association and the Association of Municipal Corporations (which represents over 400 cities and towns) on the practice of requiring contractors to submit detailed schedules of prices with tenders to local authorities for electrical installations.

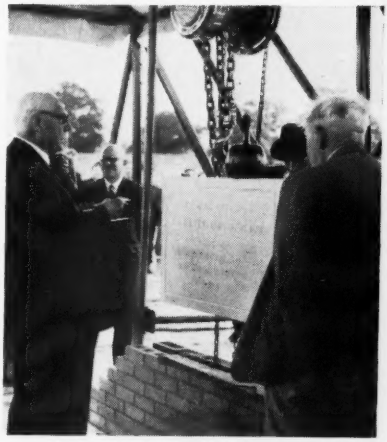
The E.C.A. suggested that the amount of time involved was "extremely great," and though at first the A.M.C. saw no reason why the practice should be discontinued, it has had a further meeting with Mr. S. L. M. Barlow of the E.C.A. As a result, its Law Committee now agrees that there might be a change of practice, and recommends municipalities to bear in mind the desirability of ensuring that schedules are drawn up for each job and only include items which are relevant; and at their discretion, to discontinue the practice of requiring detailed schedules to be submitted with the tender, on the understanding that the local authority, before letting the contract, will be free to call for detailed schedules from a small number of tenderers, say two to four. In this, they will have regard to the standing of the tenderers and the nature of the contract, and it will be understood that, when requested, the tenderers will forward such completed schedules within seven days.

British Plastics Exhibition

Attendance at the second British Plastics Exhibition which closed at Olympia, on 18th June, was up by 20 per cent as compared with the first exhibition two years ago. There were overseas visitors from fifty-one countries. The Convention, held concurrently with the Exhibition, drew attendances of up to 550 at a session. Business done by one plant manufacturer alone included orders worth £50,000 from overseas. Orders and inquiries were satisfactory generally, Australia being named by several exhibitors as the best overseas customer. The organizers are already planning for another exhibition and convention in 1955.

New Telcon Factory

Lord Colgrain, chairman of the Telegraph Construction & Maintenance Co., Ltd., laid the foundation stone of the company's new factory at the satellite town of Crawley, Sussex, on 22nd June. The factory, which will be devoted



Lord Colgrain (left) laying the foundation stone of the new Telcon factory at Crawley

to the manufacture of Telcon metals (magnetic materials, electrical resistance alloys and special metals for the electronics industry and scientific instrument makers), will be completed in about a year, and will be in full operation before the end of 1954. It involves the removal of the company's metals division from Telcon Works, Greenwich, and about 350 people will eventually be employed in the new factory.

At the luncheon at Tilgate Forest Hotel which followed the ceremony, Sir Thomas Bennett, C.B.E., chairman of the Crawley Development Corporation, was the guest of honour.

Welding Plant for Dutch Army

In 1952 the Dutch Army ordered thirty mobile welding plants for use in the field in N.A.T.O. exercises in Germany from Petbow, Ltd., of Sandwich, Kent, through their agent in Holland, and within a week a specially chartered coaster put into Dover harbour to take the sets on board. As a result the Dutch Army has standardized Petbow welding plants and has recently ordered another thirty machines. Delivery conditions were not quite so stringent,

but even so the whole batch was again put aboard a specially chartered coaster within three weeks of the order being received. The order included an auxiliary 3 kW generator fitted to the plant for supplying power to various small tools used as auxiliaries to the welding jobs. Though not a standard fitting, Petbow were able to accommodate this in the standard machines within the time permitted.

Batti-Wallahs' Society

The speaker at last week's luncheon of the Batti-Wallahs' Society was Mr. G. S. Gibson, assistant administrator to the Agent General for British Columbia, who spoke on the industrial development of that Province. Mr. Gibson, in referring to various industrial projects in hand and under consideration spoke of the opportunities for British technicians in B.C. and the desire of the Province to increase its trade with this country. He said that it would also prefer that the various projects should be assisted by British capital rather than American. Mr. Gibson followed his talk by showing a colour film of the timber industry of British Columbia.

Works Visits

The Hon. John J. Cahill, Premier of New South Wales, with Mrs. Cahill and their two daughters, visited Mirrlees, Bickerton and Day, Ltd., Stockport, on 19th June. The company has orders worth £A250,000 from New South Wales which is to spend £A14 million on new electricity generating schemes. Mr. Cahill was conducted round the works by directors and two members of the shop stewards' committee.

On 22nd June, Mr. J. J. Cahill, accompanied by Mrs. Cahill and their two daughters, visited the British Thomson-Houston Co.'s main works at Rugby. He was welcomed by Mr. E. H. Ball, managing director, B.T.H., and other directors. During a tour of part of the works, Mr. Cahill saw several items of heavy plant for New South Wales in various stages of manufacture. He also visited the lamp factory.

The Hon. A. R. G. Hawke, Premier of Western Australia, paid a visit to Metropolitan-Vickers on 23rd June, the third Commonwealth Prime Minister to have visited the Trafford Park Works last month. After being received by directors, the Premier and his party made a short tour of some of the main departments. In the transformer works they were able to see a 20,000 kVA transformer for South Fremantle under construction; a similar transformer was shipped some time ago. Another important "Metrovick" contract in hand covers forty-eight 1,100 h.p. 76 ton diesel-electric locomotives for the Western Australian Government Railways; some of the electrical equipment made at Trafford Park has been installed in the locomotives at Stockton-on-Tees, where the mechanical parts are being built and the locomotives erected by Metropolitan-Vickers-Beyer, Peacock, Ltd.

Portable Ice Rink

An unusual show in the entertainment world is being presented at the Dudley Hippodrome, Worcs, for a season which commenced on 20th June. It combines a spectacular revue on a wood stage with a skating entertainment on a rink quickly obtained by the removal of boards from the ice surface. It is claimed that the Prestcold-refrigerated ice rink used is the largest in any theatre in Europe, the stage area having been extended into the auditorium by steel scaffolding, and yet it is completely portable and can be erected and dismantled in a

The Hon. J. J. Cahill, Premier of New South Wales, at the British Thomson-Houston Co.'s Rugby works. *Back row, left to right:* **Mr. H. R. Harding (managing director, Engineering Projects, Ltd.), Mr. P. H. Roper (Under Secretary, Premier's Department), Mr. E. V. Small (managing director, B.T.H. Export Co., Ltd.), Mr. Cahill, Mr. E. H. Ball (managing director, B.T.H.), Mr. K. R. Hopkirk (director and chief mechanical engineer, B.T.H.), Mr. C. J. Tallentire (private secretary to the Premier).** *Front row, left to right:* **Miss Cahill, Mrs. Roper, Mrs. Cahill, Mrs. Hopkirk, Miss M. Cahill**

very short time. To produce the ice for this large rink 5,000ft of refrigeration piping has been laid on a heat-insulated and waterproof base and this becomes submerged in the ice as it is produced. Low temperature non-freezing brine is pumped through this refrigeration pipe which is connected to a Prestcold 50 h.p. automatic refrigeration set consisting of two compressors each driven by 25 h.p. motors. The refrigeration plant has been designed in a very compact form which also has the advantage of the highest degree of portability. It has been supplied through the Prestcold distributors for the area, Refrigeration (Birmingham), Ltd., to the instructions of Kennedy's Theatres, Ltd.

Fuel-saving Loans

An explanatory leaflet issued by the Ministry of Fuel and Power gives details of the revised scheme under which firms may apply for loans to cover expenditure on the installation of approved fuel saving equipment and structural insulation. Loans to individual firms will not normally exceed £30,000, but subject to this limit and to the work being completed in a reasonable time the amount may, in suitable cases, cover the whole cost of the proposed installation, including essential ancillary work. Repayment will be spread over the period during which the equipment is being written off for taxation purposes up to a maximum of twenty years. For the first two years after the equipment has been installed the loans will be free of interest; thereafter the interest will be at commercial rates.

Export Licensing Control

The Board of Trade announces certain changes in the export licensing controls which were to take effect from 1st July. Among these, licences will in future be required for specified machines for manufacturing coaxial electric cables for all destinations other than the Commonwealth (excluding Hong Kong), U.S.A., and the Irish Republic.

Silicone Resins and Varnishes

Three new silicones for electrical purposes, a coating resin, a laminating resin and an impregnating varnish, have been introduced by Midland Silicones, Ltd. A common feature of these materials is their high thermal stability, which is greater than that of previously available silicones. Data so far available indicate that equipment insulated with these materials may be operated at higher temperatures than those formerly associated with silicones without impairing the life of equipment or its reliability.

New G.E.C. Branch Premises

A new Magnet House in Union Street, Plymouth, was opened by the General Electric Co., Ltd., on the 18th June, under the manager-

Alderman H. G. Mason, chairman of the city's Reconstruction Committee, the Lord Mayor of Plymouth, and Mr. Leslie Gamage in one of the showrooms at the G.E.C. Plymouth premises

ship of Mr. S. Hack who opened the first G.E.C. branch there in 1928. The Lord Mayor of Plymouth, Alderman Sir J. Clifford Tozer and Mr. Leslie Gamage, vice-chairman and joint managing director of the G.E.C., performed the opening ceremony.

L.C.C. Dismisses Ex-Union Men

Two electricians who refused to rejoin the Electrical Trades Union from which they had previously been excluded, have had their employment by the L.C.C. terminated as from 24th June. Mr. I. J. Hayward, leader of the Council, in a statement, said that about 350 members of the union employed by the Council had threatened to strike because of the employment of the two men. Mr. Hayward stated that the Council's policy was to encourage all staffs to be members of their appropriate trade unions. The present situation did not arise from any question of applying the "closed-shop" principle, but from the refusal of two former union members to abide by the rules and to maintain membership. The two concerned were in dispute with the E.T.U. as a result of their failure to observe the rules of the union, following non-participation in an unofficial strike in 1951. Their failure gave rise to serious arrears of contributions and their subsequent exclusion from the union.

The Council decided to mediate in the dispute and, as a result, the E.T.U. was prepared to give sympathetic consideration to an application from the two men for re-admission to membership of the union, and gave assurances that, within the rules of the union, every facility would be given for a fair hearing of the application. Difficulties were, however, caused by the failure of the men to co-operate in the efforts to achieve progress. Had the men made application for re-admission to the union, their case could have

been considered and the terms of re-admission decided upon, and if the men had been dissatisfied they could have exercised their right of appeal under the union's rule. The Council considered it had made every effort to conciliate and that the union had acted in a reasonable and proper manner. Since, however, the men would not settle their differences with the union in accordance with the rules, there was nothing more the Council could do to help them. When, as a result of the men's attitude, the stage was reached where the carrying out of the threat to strike was imminent, it became necessary in the public interest for the Council to take action to avert a dislocation of its essential services.

North Staffordshire Exhibition

Electrical appliances were much in evidence at the North Staffordshire Modern Homes, Trades & Fashion Fair held recently at Hanley. The Midlands Electricity Board had two stands. On one of these continuous demonstrations were given of cookers, washing machines, ironers, drying cabinets, kitchen aids and radio and television apparatus. The other stand was devoted entirely to a display of refrigeration equipment, a specially interesting feature being a chart showing the temperatures required for the commercial storage of different kinds of foodstuffs and drinks. Another refrigeration exhibit included representative examples from the range of Prestcold domestic refrigerators, cold rooms, service cabinets, farm freezers, milk coolers, frozen food cabinets, ice-cream conservators, etc.

Washing machines of a variety of makes were demonstrated by Home Aids, while both Wilkins & Mitchell, Ltd. ("Servis") and Hoover, Ltd., had separate displays of their own machines, the latter company also showing some of its vacuum cleaners and polishers. The "Formashayd" detachable, collapsible loose cover lampshade was exhibited by G. & S. Wright, Ltd., and a device claimed to provide small quantities of boiling water was shown by Insta-Heater.

Fuel Research

The reports of the Fuel Research Board and of its Director, Dr. A. Parker, for 1952 (H.M. Stationery Office, 2s 6d) refer to success achieved in making metallurgical coke from blends of first grade Durham coking coal with up to 50 per cent of weakly coking Northumberland coal. Experiments similar in nature are in hand in relation to domestic coke. In preliminary trials of a new cyclone generator combustible gas has been produced from coal below $\frac{1}{16}$in at high temperatures, air being enriched with oxygen; air without oxygen will be used for trials with coke breeze. Fluidity of furnace fuel oil has been found to improve with increase in size of the wax crystals that form in the oil. Further developments in the design and operation of combustion chambers for gas turbines to enable coal and peat to be used as fuel are reported.

Investigations of room-heating efficiencies of different types of appliance are being carried out in the "calorimeter building" and tests of cookers, stoves and grates are made, in addition to research work. Measurements made in London during the fog last December are proving of value to the medical authorities.

Details are given of the work in hand on boiler availability, including the removal of sulphur compounds from flue gas, and also of researches into the fundamentals of the chemistry and physics involved, such as coal constitution, surface chemistry and the use of radio-active tracers in a study of the Fischer-Tropsch synthesis.

Steel Denationalization

Mr. Sandys, Minister of Supply, announced on Monday that 13th July had been fixed as the "appointed day" on which the Iron and Steel Act, 1953, denationalizes the industry.

Royal Highland Show

A highly successful "Electricity on the Farm" pavilion was staged at this year's Royal Highland and Agricultural Society Show at Alloa from 23rd to 26th June by the British Electrical Development Association and the South East Scotland Electricity Board. While concentrating on applications of power to agriculture, the display nevertheless gave increased space to the domestic use of electricity. Inside the large pavilion there were separate sections relating to pigs, dairying, barn equipment, dairy refrigeration and tools.

The last section was particularly successful and used a new technique to attract interest. With the theme, "What tools can do," it was arranged as a three-deck display. The top deck showed the tool in an illuminated wall section. Below was a transparency which lit up when that particular tool was plugged home and the actual tool was shown at work on the tool bench below. New equipment shown included the Heatrae farm food boiler and a new tool made by James A. Cuthbertson, Ltd., for laying continuous lengths of electric cable, steel tubing or alkathene piping, without trench cutting, back filling or other work.

Mass Production of Bread

The first two all-electric swing-tray baking ovens in Europe, each capable of baking over 1,200 loaves per hour, were put into service at the opening of the new all-electric bakery of the Chester Co-operative Society, Ltd., by Councillor B. Reynolds, O.B.E., J.P., at Chester on Saturday last, 27th June. The 375 kW ovens have been constructed by the General Electric Co., Ltd., and each 31ft oven has 53 swinging trays capable of carrying 15 2-lb loaves, which are conveyed through four heating

zones on a 70ft conveyor. The loaves are in the ovens for about 40 min. Each heating zone has its own thermostatic control so that by means of press-button switches the maintained temperature in any one section can be adjusted. Press-button switches are also employed to start the conveyor and to regulate its speed. A spy hole is provided at one end of each of the ovens, which has interior lights, so that the bakery manager can watch the progress of baking within.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £155 0s 0d
COPPER, H.C. Electro	ton £252 0s 0d
Fire Refined 99·70 per cent ..	ton £251 0s 0d
Fire Refined 99·50 per cent ..	ton £250 0s 0d
COPPER Tubes	lb 2s 4·d
Sheet	ton £305 10s 0d
H.C. wire and strip	ton £281 10s 0d
LEAD, English	ton £89 15s 0d
Foreign	ton £88 0s 0d
MERCURY	flask £70 10s 0d
TIN	ton £655 0s 0d
ZINC, G.O.B. Foreign	ton £72 0s 0d
Electrolytic	ton £71 5s 0d
BRASS Tubes	lb 1s 11½d
Sheet	ton £243 10s 0d
Wire	lb 2s 6½d
PHOSPHOR BRONZE	
Wire	lb 3s 9½d
RUBBER, No. 1 R.S.S. spot ..	lb 19.d–19·d

Time-Recording

We reported in our 1st May issue that the Electrical Power Engineers' Association had informed the British Electricity Authority that it would resist the imposition of time-recording ("clocking-in") on its members. In the June issue of the *Electrical Power Engineer* it is stated that, while the Association has not abated one whit its objection to any system of time-recording being applied to technical staff, it has agreed that existing practices shall continue until the subject has been discussed by the Negotiating Committee of the National Joint Board, Electricity Supply Industry.

Atlantic Cable Renewal

The renewal of Cable & Wireless, Ltd.'s direct cable across the North Atlantic from Porthcurno, near Land's End, to Newfoundland will be completed by mid-August. H.M.T.S. *Monarch*, which the company has chartered to carry out the renewal, will leave London early in July. The work will entail replacing 1,250 miles of submarine cable.

Work on renewing the cable was begun last year when an 800 mile section was replaced in mid-Atlantic. Communication between Porthcurno and Harbour Grace was then restored on 6th August for the first time since the cable was interrupted in 1943. The *Monarch* will complete the renewal by extending last year's work eastward into Porthcurno and westward into St. Johns, Newfoundland. She will renew, also, part of the cable joining Newfoundland with the Canadian mainland at Halifax, Nova Scotia. The total cost of the work will be £1,900,000 and the traffic carrying capacity of the cable will be increased by 70 per cent. This transatlantic cable serves Canada and is linked with the company's Pacific cables to Australia and New Zealand by trans-Canadian landlines.

Trade Announcements

Mr. James Wood, Glenan Gardens, Helensburgh, Dunbartonshire, has been appointed by **Ega Electric, Ltd.**, as its agent for the whole of Scotland.

New London offices, showrooms and trade counter have been opened by the **Ensel Electric Co., Ltd.**, at 218, Upper Street, N.1. (telephone : Canonbury 2251/2).

Mr. J. W. D. Le Lievre has been appointed by **Ekco-Ensign Electric, Ltd.**, as its representative covering certain parts of the Manchester area. He will operate from the company's northern sales office, Kent Street Works, Preston.

London Transformer Products, Ltd., have appointed Mr. W. Wheeler their sole representative in South West England covering the counties of Gloucestershire, Somersetshire, Wiltshire, Dorset, Devon and Cornwall.

S. N. Bridges & Co., Ltd., have established a new sales and service depot for the North West and Yorkshire areas at 40, Spring Street, Sheffield, 3, under the management of Mr. G. Taylor, newly appointed area manager for this region. Mr. Taylor is being assisted in the Lancashire and North West Counties by Mr. McClelland, and in the Yorkshire area by Mr. Cunliffe.

Catalogues and Lists

Austin Crompton Parkinson Electric Vehicles, Ltd., 95-99, Ladbroke Grove, London, W.11.—Descriptive folder illustrating a range of Morrison Electricar mobile shops.

Nettle Accessories, Ltd., Harper Road, Wythenshawe, Manchester.—28-page illustrated catalogue of "Nettle" quick-wiring electrical accessories together with price list (24), and four leaflets announcing weatherproof socket outlets and plug tops, striplighting fittings, rubber cable couplers and 13 A ring main accessories.

Electrical Remote Control Co., Ltd., East Industrial Estate, Harlow New Town, Essex.—Descriptive leaflet illustrating the new "Elremco" low voltage soldering iron busbar installation (100).

Electric Meter Co., Castle Circus House, Torquay, Devon.—Priced catalogue of new and reconditioned electric meters.

Cross-Channel Power Project

Tests to be Completed Early Next Year

As reported last week in the *Electrical Review*, the investigations into the proposal to connect the 132 kV grid of the British Electricity Authority with the 225 kV system of Electricité de France will be carried a stage further within the next few weeks. This part of the work comprises the laying, dielectric testing with artificial load, repairing and recovery for examination of jointed lengths of the cable. This procedure follows the recommendations of the joint committee formed in 1949 by the two authorities and accepted in principle by them in June last year. The tests are expected to be completed early next year.

Gas-Compression Cable Tests

The two half-mile lengths of British cable are to be jointed to a 300 yd length of French cable near Dover. Meanwhile in France developments are in hand for tests (including loading cycle and d.c.) on two to four 100 yd sections of gas-compression cable, jointed to form a loop, laid off a jetty in deep water near Calais. Different methods of locating artificial gas faults and testing the maintenance of gas pressure and penetration of sea water into the insulation under fault conditions will be tried.

As envisaged, the circuit across the Straits of Dover comprises three single-core 132 kV cables, possibly with a fourth as spare. The shortest distance is twenty-six miles with a maximum depth of 240ft, but the route selected must take account of several relatively shallow banks and communication cables and must avoid obstacles such as numerous sunken vessels.

Two types of cable are under consideration—the external gas compression cable and the pre-impregnated gas pressure cable—the first because of its high inherent electric strength and the apparent extra security against damage provided by the two lead sheaths, and the second because of its simplicity and the possibility of its manufacture in long sections.

In Britain attention has been mainly concentrated on the latter with particular regard to the manufacture and works testing of sample armoured lengths, of flexible joints having a diameter not exceeding that of the cable itself, and of rigid joints suitable for quick repair at sea. In France similar work is being done in two designs of external compression cable and two of pre-impregnated pressure cable. In addition, severe mechanical and electrical tests are to be carried out on 125 yd sections of both types of cable and their joints at the Fontenay Research Centre of Electricité de France; these will be connected directly to the French 225 kV system and subjected to long duration stability tests under artificial loading cycles.

British Insulated Callender's Cables, Ltd., have been awarded the contract for the sea trials for the project. The company is working in close collaboration with W. T. Glover & Co., Ltd., whose design of 132 kV gas-filled cable has been chosen for this contract. The associated cable accessories have been designed by B.I.C.C. and the whole of the installation work will be carried out by the B.I.C. Construction Co., Ltd.

Electricity in the Kitchen

OF interest to people who are considering building a new house, or who are moving to another home, or merely doing up their present one is a 16-page brochure entitled "Electricity In Your Kitchen." Printed in four colours, the book is generously illustrated with photographs of kitchen interiors and domestic appliances and also contains plans and diagrams to enable the kitchen to be labour-saving.

The book contains chapters on electric cooking and on water heating, washing and ironing by electricity, as well as the advantages of food storage in electric refrigerators. The importance of good lighting in the kitchen is stressed, while it is made clear that the cleanliness of electricity enables the use of bright colour. The booklet is published by the British Electrical Development Association, 2, Savoy Hill, London, W.C.2, and is also obtainable from electricity service centres and showrooms.

PARLIAMENTARY NEWS

By Our Special Reporter

ON the Committee stage of the Finance Bill in the House of Commons last week Mr. Crosland moved a new clause to allow expenditure incurred on the purchase and installation of improved solid fuel appliances to be offset against Schedule "A" payments. He said that the clause followed the recommendations of the Ridley Committee.

Mr. Nabarro seconded.

Mr. Maudling, the Economic Secretary to the Treasury, said that there was general agreement about the desirability of the widespread use of these appliances but the question was whether it was a good thing to stimulate their use by the device proposed in the new clause. It was important to avoid the introduction of new discriminations and new complications into the administration of the income tax law. At present there was a very substantial discrimination in favour of the solid fuel appliance, which bore no purchase tax, as against the electric fire, which would continue to bear purchase tax at the very heavy rate of 75 per cent. There was the added point that solid fuel appliances were not affected in any way by hire purchase restrictions. He also understood that it was arguable whether these new appliances contributed to the prevention of smoke pollution, because they were capable of burning lower grade fuels. So far as he knew, there would be no very substantial saving of fuel as the result of the widespread installation of these appliances. His own personal experience of installing one of them was not a saving of fuel, but the fact that one did not have to get up in the morning and light the fire. Unless it could be shown that there were substantial fuel benefits to be derived from the appliances, the only benefit would be the greater comfort which people enjoyed in their homes from their use. That was no doubt a good thing, but it was not a good reason for introducing a new principle of taxation to encourage people to buy appliances to make them more comfortable. As a matter of fact, there had been a very substantial increase in the sale of these appliances. In the first quarter of this year their sale reached the record total of 630,000, which was more than double the total sales in 1951.

The new clause was negatived.

Chief Joseph Dam

Mr. Grimond asked the President of the Board of Trade if he would make a further statement on the allocation of contracts to British firms for the Chief Joseph Dam project.

Mr. Peter Thorneycroft said he was glad to have this opportunity of congratulating the English Electric Co. on securing the contract for the transformers worth some $\$1\frac{3}{4}$ million for the Chief Joseph Dam project. The generator contract, worth some $\$4\frac{1}{4}$ million, was awarded to an American company, the Westinghouse Electric Corporation, which reduced its original bid by over $600,000 after it had been given a second opportunity to tender.

Mr. Grimond asked if the President did not agree that it was a remarkable tribute to the British engineering industry that in the face of world-wide competition and the competition of the main American firms this British firm succeeded in obtaining this contract.

Mr. George Strauss asked if the specification was exactly the same in the second tender, because, if it was, then quite clearly the reduction by the Westinghouse Company was grossly unfair and contrary to normal good trade practice.

Mr. Thorneycroft said that neither in the original specification nor in the second invitation were the quantities or the weights of materials to be used specified, which was one of the excuses put forward for the second round of tenders.

Electricity from Peat

Sir David Robertson asked the Secretary of State for Scotland why the project of the North of Scotland Hydro-Electric Board for the generation of electricity from peat continued to be delayed.

Mr. Henderson Stewart said that there had been no undue delay. Successful experiments had been carried out in the burning of peat in gas turbines. Sir Edward Appleton's Committee had now recommended that the Board should receive financial assistance through the Development Fund to establish an experimental peat-burning station in Caithness. This proposal was being carefully considered and he hoped that an early decision might be reached.

Rural Electrification

Sir Thomas Dugdale, Minister of Agriculture, circulated in the Official Report last week the following figures showing the percentages of farms connected in the area of each Electricity Board (except London):—

South Eastern 59·8; Southern 69·4; South Western 33·7; Eastern 48·2; East Midlands 47·6; Midlands 42·5; South Wales 17·4;

Merseyside and N. Wales 25·2; Yorkshire 43·4; North Eastern 26·9; and North Western 61·5.

Hire Purchase of Electric Washers

Mr. Vaughan-Morgan asked the President of the Board of Trade whether, in view of the improvement in steel supplies, he would consider excluding electric washing machines from the Hire-Purchase and Credit Sale Agreements (Control) Order, 1952.

Mr. Peter Thorneycroft replied in the negative. These restrictions on hire-purchase were still necessary in present economic conditions.

Television in Remote Areas

Replying to Sir David Robertson the Assistant Postmaster-General (Mr. Gammans) said that the cost of extending television service to the Northern Highlands and other outlying parts of the country would be very high, as not only would television stations be needed, but also long connecting links for distributing programmes from the existing network. He much regretted that expenditure on the scale required could not be contemplated, at any rate for a very long time to come.

Electronics Industry

Mr. Malcolm MacPherson asked the Minister of Supply what estimate he had of the total value of the output of the electronics industry in the 12 months ended on the latest convenient date; and what estimate he could give of the share of the Scottish electronics industry in the total.

Mr. Sandys said the figures were £125 million and £2 million, respectively.

Mr. Malcolm MacPherson asked what progress had been made in the building of the new laboratory block in Edinburgh for the electronics industry; and what further progress had been made by the group of Scottish firms associated for the purpose of doing electronic work.

Mr. Sandys said that work on the site of the laboratory block began on 15th November, 1952, had progressed as planned and should be completed in July, 1954. Full implementation of the group scheme initiated by the Scottish Council must await the completion of the new laboratory block.

Severn Barrage

Mr. Wedgwood Benn asked the Minister of Fuel and Power if he would grant permission for work to begin in the near future on the Severn Barrage in view of its importance to the West Country and the nation.

Mr. Geoffrey Lloyd replied that the economic case for embarking on this project in present conditions was not established. Meanwhile research was in hand on various unsolved technical problems, and experiments were being made on models to determine the effect of the barrage on Bristol Channel ports.

I.E.E. PREMIUMS

THE Council of The Institution of Electrical Engineers has made the following award of Premiums for papers read or accepted for publication during the Session 1952-53.

Group A.—*Kelvin Premium:* W. Culshaw, B.Sc., Ph.D. *John Hopkinson Premium:* D. McDonald, B.Sc.

Group B.—Non-Section Premiums: *Llewellyn B. Atkinson Premium:* O. J. Crompton, M.Eng., and G. A. Wallace, B.Sc.(Eng.). *Extra Premium:* C. G. Clayton.

Measurements Section.—*Silvanus Thompson Premium:* P. S. T. Buckerfield. *Mather Premium:* L. Hartshorn, D.Sc., J. V. L. Parry, M.Sc., and E. Rushton, B.Sc.(Eng.). *Extra Premiums:* C. Ryder, J. Rushton and F. M. Pearce, B.Sc.(Eng.); K. F. Sander, M.A., Ph.D., and J. G. Yates, M.A.; R. V. Moore, G.C., B.Sc.(Eng.); R. H. Dunn, B.Sc., and C. H. Chambers.

Radio Section Premiums.—*Duddell Premium:* D. C. Birkinshaw, M.B.E., M.A. *Ambrose Fleming Premium:* D. A. Wright, M.Sc. *Extra Premiums:* H. Cafferata, C. Gillam and J. F. Ramsay, M.A.; E. McP. Leyton (Princeton, U.S.A.), E. A. Nind, B.Sc.(Eng.) and W. S. Percival, B.Sc.(Eng.); Prof. F. C. Williams, O.B.E., D.Sc., D.Phil., F.R.S., and G. B. B. Chaplin, M.Sc.; G. R. M. Garratt, M.A., and A. H. Mumford, O.B.E., B.Sc.(Eng.); B. G. Pressey, Ph.D., M.Sc.(Eng.), G. E. Ashwell, B.Sc., and C. S. Fowler; P. A. T. Bevan, B.Sc.; W. R. Piggott, B.Sc.; H. E. Holman and W. P. Lucas; E. C. Cherry, D.Sc., and G. G. Gouriet; A. J. Biggs, Ph.D., B.Sc., and E. O. Holland; L. C. Jesty, B.Sc.; Prof. H. E. M. Barlow, Ph.D., B.Sc.(Eng.), A. L. Cullen, Ph.D., B.Sc. (Eng.), and A. E. Karbowiak.

Supply Section Premiums.—*Sebastian de Ferranti Premium:* A. F. B. Young, B.Sc. *John Snell Premium:* L. G. Brazier, Ph.D., B.Sc., D. T. Hollingsworth, and A. L. Williams, Ph.D., M.Sc. *Extra Premium:* M. W. Humphrey Davies, M.Sc., and G. R. Slemon, Ph.D., M.A.Sc.

Utilization Section Premiums.—*Crompton Premium:* B. L. Metcalf, B.Sc.(Eng.), and G. Cuttle, T.D. *Swan Premium:* B. C. Robinson, M.Sc., Ph.D. *Extra Premium:* Prof. Y. H. Ku, Sc.D. (Philadelphia, U.S.A.).

Group C.—*Frank Gill Premium:* L. B. S. Golds (Ipswich) and P. Schiller, Dipl. Ing. *Heaviside Premium:* R. H. Barker, B.Sc. *Paris Exhibition* (1881) *Premium:* C. A. Cameron Brown, B.Sc., and P. G. Finn-Kelcey. *Webber Premium:* G. W. A. Dummer, M.B.E., and D. L. Johnston, B.Sc.(Eng.). *Students' Premiums:* B. Z. de Ferranti, B.Sc., B.E. J. B. Gopsill, B.Sc., J. A. S. Hilditch, B.Sc. L. L. Alston, B.Sc.(Eng.), J. C. Arkless, B.Sc. D. G. Berry, B.Sc., D. W. Birnstingl, B.Sc (Eng.), J. H. Davis, J. P. Harbord, B.Sc.(Eng.) and J. M. Raven.

ELECTRICITY SUPPLY

Board to Hire Immersion Heaters

Advertising Announcement Welcomed

AT last week's meeting of the East Midlands Electricity Consultative Council at Nottingham it was stated that the Board, which was already hiring electric cookers and washboilers on quarterly rentals, had decided to extend the hire scheme to include immersion heaters. It was explained that consumers in many districts were able, before the war, to hire immersion heaters, but the facility had been withdrawn during the war owing to shortage of materials and labour. The quarterly rentals would be 6s 6d where the wiring was provided by the consumer and 8s 8d where it was provided by the Board. The installation would include thermostat and lagging jacket.

Mr. C. R. King, chairman of the Board, welcomed the increase in capital allocated to Area Boards for rural development, but pointed out that to reach the more remote villages and farms costly mains extensions were necessary. These connections would be completely uneconomic unless the fullest use was made of the supply by the farms and other consumers and for that reason he was pleased to note that the Minister had removed the ban on promotional publicity. The Board would now be able to follow a more realistic policy in selling electricity and he hoped that a greatly increased use of the supply would follow. It had been the practice of the Board not to demand a capital contribution from farmers towards the cost of mains extensions but to ask the farmer to guarantee a reasonable annual consumption. The Board preferred the farmer to spend his money on equipping his farm with electrical apparatus. Mr. King revealed that the Board was building up a team of salesmen to visit farms.

Development and Tariffs

Lifting the ban on advertising electricity may mean that there will be no further increases in charges. This forecast was made last week-end by the deputy chairman of the Midlands Electricity Board, Mr. D. H. Kendon. After the announcement by the Minister of Fuel and Power, it was stated that the Midlands Electricity Board had its plans prepared to start an advertising campaign telling consumers how to get the best out of electricity. "The more electricity we can sell, the more it helps to keep down the cost," said Mr. Kendon. "It means that the standing charges are spread. When we have the plant, it is obviously more economical to use it fully."

Belfast Electricity Profit

A net profit of £102,939 for the year 1952–53 is recorded in the annual report of the Belfast Corporation Electricity Department. Mr. R. P. Watson, the acting city electrical engineer, says that there was an increase in revenue of £158,592 over the previous year, and total costs, including loan charges, increased by £163,154. The total number of kWh sold in the Corporation's area of supply during the year was 374·2 million, a decrease of 0·7 million on 1951–52, which is attributed mainly to trade recession.

Sutherland Scheme Confirmed

The Loch Shin Scheme in Sutherland, one of the North of Scotland Hydro-Electric Board's major projects, which will produce about 151 million kWh a year, has been confirmed by the Secretary of State for Scotland. The scheme covers a catchment area of over 250 square miles and will develop the water power resources of Loch Shin, its tributary streams, the River Cassley and the upper part of the River Brora. Four dams will be built and five generating stations with a total capacity of 40,000 kW will be constructed. All objections lodged against the scheme have been withdrawn.

Choice of Cookers

Sheffield Housing Committee has recommended that new tenants shall be given the option of having either gas or electric cookers installed when the houses are first occupied.

Seaside Illuminations

For the 1953 Blackpool Illuminations—the twenty-first—display materials valued at more than £360,000 will be woven into the largest lighting spectacle of its kind at a cost of £70,000. It will last this year from Friday, 11th September, until Monday, 26th October, and over a third of a million coloured lights will festoon the promenade. The total loading will be 2,300 kW and 500,000 kWh will be consumed during the period of the illuminations. Details

of the plans which we have received from Mr. H. Carpenter, the Corporation illuminations and public lighting officer, show that many novelties are to be introduced, including "3D" tableaux. The biggest tableau will be 650ft in length.

Sunderland Town Council is to spend £18,000 on its illuminations display this year, £6,000 more than last year. The display will be held from 28th August to 27th September.

Fuel Costs in Ireland

Replying to the debate on the second stage of the Turf Development Bill in the Dail, Mr. Lemass (Minister for Industry and Commerce) gave the following figures for the production of electricity from various fuels used in the Electricity Supply Board's generating stations in the financial year ended 31st March last:—Pigeon House (coal), 0·96d/kWh; North Wall (oil), 0·79d; Portarlington (turf), 0·76d; and Allenwood (turf), 0·81d. He said that since the end of the financial year the prices of coal and oil had been reduced and also that of turf for the Portarlington station, but at Allenwood there had been an increase. The comparative costs per kWh were: Pigeon House, 0·82d; North Wall, 0·64d; Portarlington, 0·64d; and Allenwood, 0·84d.

Girvan Reinforcement

A scheme, estimated to cost £20,127, for reinforcing the network at Girvan, Ayrshire, by changing from 3·3 to 11 kV operation, has been approved by the South West Scotland Electricity Board.

Supplies to New Houses

The South West Scotland Electricity Board has approved schemes estimated to cost altogether £109,000 for supplying electricity to 445 new houses being erected at East Kilbride, 222 at Greenock and 1,118 at Arden, Thornliebank.

ELECTRICAL TRADING BY IRONMONGERS

THE possibility of ironmongers being able to market a low-priced electric lamp which could be sold in competition with large stores was mentioned in the report of the Electrical Section of the National Federation of Ironmongers presented at the Federation's recent annual conference at Southport. The report stated that negotiations with one manufacturer had broken down, but an approach had been made to a further maker and discussions were continuing. Although many difficulties would have to be overcome before such a lamp could be made available, the Federation was hopeful of the eventual outcome.

Amplifying the report, Mr. L. Hall, chairman of the Electrical Section, told members that he hoped the proposal would become an accomplished fact before the year was out. The N.F.I. lamp, as they would prefer to call it, would be cheap in price only; it would be efficient, fully tested and subject to the usual guarantees. Members' replies to a questionnaire had convinced the Section Committee that the demand was there and that the vast majority of ironmongers would welcome such a lamp. Some of the replies suggested that members had not read their new E.L.M.A. agreements and were under the impression that after signing the agreements they were bound to sell only E.L.M.A. lamps, whereas retailers could now sell any make of lamp without "let, hindrance or penalty."

The chairman also reported that the Section Committee had met the newly appointed Electrical Retailers' National Committee of the National Electrical Contractors' Trading Association and had discussed such items as purchase tax liability, quantity discounts, discount splitting organizations and the possibility of pressing for a washing machine installation charge. Agreement had been reached to take joint action on a number of questions. The next task would be to widen the scope of the Joint Co-ordinating Committee until all trade associations interested in electrical matters had joined in. Referring to purchase tax, he said it had been computed that ironmongers had lost half a million pounds as a result of the recent reductions and the Section was doing all it could to see that it did not happen again. One of the avenues being explored was the buying of goods on a sale or return basis from January onwards "until this pernicious tax is abolished."

It was stated in the Section's report that the results of an inquiry into the hire-purchase terms offered by Electricity Boards on a comprehensive range of goods indicated that the terms could not possibly be operated on a sound business basis and must be subsidized out of normal revenue from the sale of electricity. Every possible action, including co-operation with the National Chamber of Trade, was being taken, but no alteration in the terms could be hoped for in the immediate future.

Reporting on the activities of the National Association of Tool Dealers, Mr. H. Ardron expressed the Association's concern at the granting of re-sale terms to Co-operative Societies and the British Electricity Authority by the Portable Electric Tool Manufacturers' Association.

Works Tour

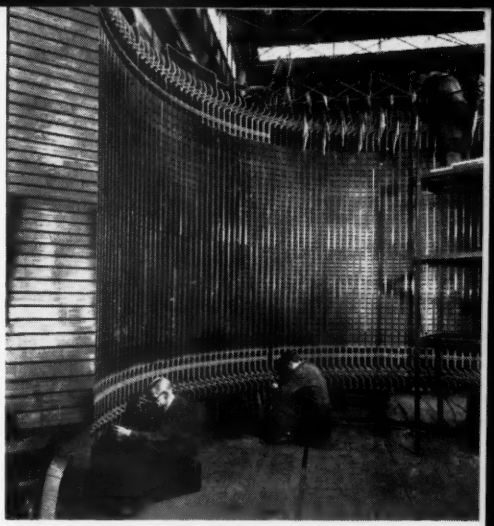
Two-Day Visit to Stafford and Preston Establishments

LAST week a large party of distinguished visitors from overseas, Government officials, prominent engineers and directors of the company and its associates travelled by special train from London on a two-day tour of some of the establishments of the English Electric Co., Ltd. Sir George H. Nelson, chairman and managing director, welcomed his guests at Stafford where in addition to viewing work in progress at that works there were opportunities of learning something of the activities of the Nelson Research Laboratories, which cover about four acres adjacent to the factory and serve the whole organization, though there are other laboratories on a separate site that specialize in the construction and investigation of machines used in nuclear physics research.

After tea the train was rejoined for Southport where Mr. H. G. Nelson, deputy managing director, presided at dinner and outlined the purpose and achievements of the Preston works, visited next morning.

Products of the Stafford factory (originally Siemens Bros. Dynamo Works) include large turbo- and other alternators and d.c. generators, large a.c. and d.c. motors, large transformers and reactors, air-blast and the larger classes of oil-break switchgear, mine winders, rolling mill plant, control gear for testing i.c. engines, dynamometers, mercury arc rectifiers, meters, instruments and industrial electronic equipment. Among the machines seen under construction were a hydrogen cooled turbo-alternator of 76,000 kVA for Stourport and one of 75,000 kVA for Drakelow, both of 3,000 r.p.m.; also one of 70,588 kVA and 3,600 r.p.m. for the Hydro-Electric Power Commission of Ontario, Canada, while large vertical water-turbine-driven alternators are in course of manufacture for Kemano, Canada; Castril, Portugal; Salime, Spain; Barrios de Luna, Spain; and the Snowy Mountains scheme in Australia.

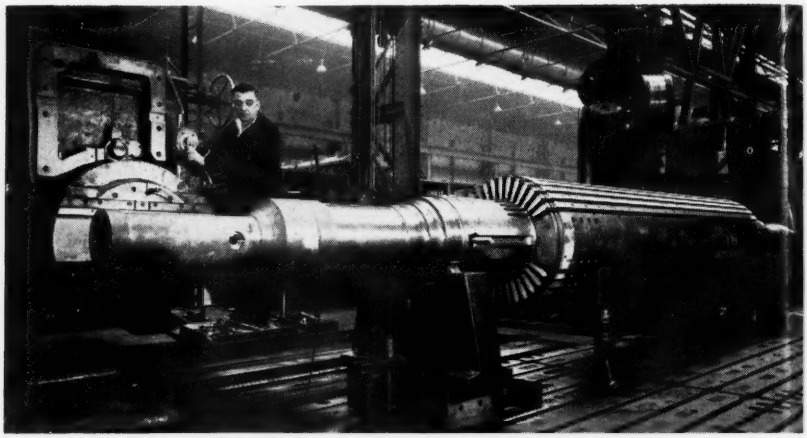
Northern Rhodesia was represented by a horizontal water-turbine alternator of 3,750 kVA and 750 r.p.m. for Victoria Falls and South Africa by an air cooled turbo-alternator of 35,300 kVA and 3,000 r.p.m. for Vierfontein.



Winding a section of the stator for a 122,000 kVA water-turbine alternator for Kemano, Canada

Of two large mill motors that attracted attention, one was a double armature design of 4,000 b.h.p. and 35/90 r.p.m. for Longwy, France, and the other an a.c. reversing motor of 5,840 h.p. and 52/120 r.p.m. for Sandviken, Sweden. Each is capable of a peak load of three times normal.

3,600 h.p. 3,000 V d.c. locomotive for Spanish National Railways



Machining the rotor of a 75,000 kVA 3,000 r.p.m. turbo-alternator

In the Transformer Department were designs of various types and ratings for home and foreign orders while regenerative braking and loading cubicles for the South African Railways were also seen and in the Switchgear Department were breakers and station control and relay boards for South Africa.

Among sealed steel tank mercury-arc rectifiers in process of manufacture were one of 500 kW and 220 V for South African Naval Forces, Durban; two 2,100 kW and one 4,200 kW at 750 V for a gas turbine plant in a British aircraft factory; and two of 2,500 V for British Railways.

The Preston factory (formerly Dick Kerr Works), which during the war built over 3,000 bombers, is still making aircraft as well as electric and diesel-electric locomotives and electric stock, traction motors and railway, tramway and trolley-bus control gear. Ten 1,500 h.p. diesel-electric main line locomotives are in course of delivery to the Queensland Government Railways. Twenty-five 2,400 h.p. 1,500 V d.c. electric locomotives are being delivered to the Victorian Government Railways for heavy freight and passenger trains on the Gippsland main line between Melbourne and Tralalgon, 95 miles, with lengthy gradients of 1 in 50; diesel-electric shunting engines are on order for the Netherlands and 3,000 V d.c. main line locomotives for Spain (sixty-three) are said to be the most powerful of their type yet built in Great Britain for passenger and freight train operation on electrified main lines. Initially the locomotives will operate on the 38 mile Ujo-Busdongo section of the Oviedo-Leon route, which carries a heavy mineral traffic, and is one of the most difficult in Spain, combining a ruling gradient of 1 in 50 with severe curvature. Their electrical equipment is being built at Preston while the Vulcan Foundry, Ltd., is building the mechanical parts.

The jet propelled " Canberra " bomber was designed at the Preston works and is made there, then going to Samlisbury aerodrome for final assembly and flight tests. It was there that the visitors watched a striking demonstration of this machine in flight before returning to Preston for luncheon prior to leaving for London on the Tuesday evening.

Electrical Apprentices' Scholarships

The first scholarships given by the Apprenticeship and Training Council for the Electrical Contracting Industry have been awarded this year. The scholarships, tenable for three years, for degree courses at a university or for Higher National Diploma courses at a technical college, and covering fees, examination expenses and maintenance allowances, have been won by D. A. Cole, of Dagenham, Essex, a student at Poplar Technical College and B. H. Walter, of Otham, near Maidstone, a student at Maidstone Technical College. They will receive their certificates of award from the Minister of Works, Sir David Eccles, on 15th July.

Wind Power Exhibition

IN connection with the installation for testing near St. Albans of a 100 kW 415 V wind-driven generator for the B.E.A., the main contractors, Enfield Cables, Ltd., have staged a working display (open until to-morrow) illustrative of the many possible applications of electricity derived from intermittent sources of power.

Exhibits lent by their makers include the following: pumped storage for hydro-electric schemes (English Electric Co.); pumps for irrigation (Sumo Pumps); electrode boilers, 30 kW totally enclosed with automatic control, switchgear, tank and feed pump (G.W.B. Furnaces "Autolec"); steam accumulator, 150 lb/sq in (Steam Storage Co.), supplying $2\frac{1}{2}$ h.p. steam engine (National Research Development Corporation); charging accumulators (Nife Batteries); electrolysers (International Electrolytic Plant Co.) for producing hydrogen from water, d.c. at 24 V being converted from three-phase by 500 A selenium-metal rectifiers (Electric Construction Co.), and providing fuel for 1 kW electric lighting plant (R. A. Lister & Co., modified by Ricardo & Co.); space heating by elements buried in concrete floor (E.R.A.), by latent heat storage in chemical salts (E.R.A.) and by $1\frac{1}{2}$ kW thermal storage heater (Aberdare Electric Co.); thermal storage electric cooker (Sonner, Norway); 50 gal off-peak storage water heater (Aidas Electric); domestic refrigerator (English Electric Co.); 2 kW sterilizing unit for dairy (J. W. Woolley & Co.); soil heating (Enfield Cables and Electrocult) with 20 A synchronous motor driven time switch (Sangamo Weston); domestic heat pump, using larder as source of low grade heat and hot water tank as sink for high-grade heat (E.R.A.); fire protection (Pyrene Co.); mergers and other instruments (Evershed & Vignoles). The exhibits also include anemometers and recorders for wind survey, and a relief model of Mynydd Anelog, Carnarvonshire, the final site proposed for the wind turbine (E.R.A.).

In addition to the 100 kW depression type unit now being erected there is a French 10 kW prototype machine which is now running. Principal sub-contractors to Enfield Cables, Ltd., are De Havilland Propellers, Ltd. (design and manufacture), English Electric Co., Ltd. (design and manufacture of electrical equipment), Redheugh Iron & Steel Co., Ltd. (steelwork and erection), and Butters Bros. & Co., Ltd. (lifting gear).

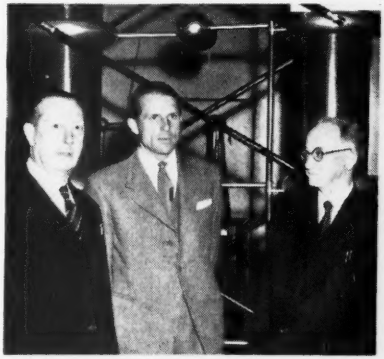
Nuclear Particle Laboratory

AT Queen Mary College (University of London) on Tuesday last week Sir George H. Nelson (chairman and managing director of the English Electric Group) who is a Governor of the College, officially opened the Nuclear Particle Laboratory, in the presence of a distinguished company of engineers and scientists.

Among equipment of interest in the main laboratory are a 1 MV impulse generator, a 5 MV single impulse betatron and a 1 MV van de Graaff generator. In the other rooms are an electron microscope, apparatus for experiments on conduction in high vacuum, and radio-active counting equipment used in the undergraduate course in nuclear energy.

The chairman of the Queen Mary College Governors, Sir Albert Stern, introduced Sir George and spoke of his generous benefactions to the college. Mr. R. L. Fortescue, who is in charge of the work, explained the equipment and aims of the laboratory.

In declaring the laboratory open, Sir George Nelson hoped the college would approach the ever-widening engineering developments, which owed from progress in nuclear research, with vigour and with courage. He paid particular tribute to the work of Professor W. J. John, head for the Department of Electrical Engineering, for the energetic and far-sighted manner in which the department had been developed.



The opening of the Nuclear Particle Laboratory at Queen Mary College: *(Left to right)*—**Sir George Nelson, Mr. R. L. Fortescue and Professor W. J. John**

Financial Section

STOCKS and SHARES

SOMEWHAT unsettled conditions continue to prevail in the Stock Exchange. To the unusual number of distractions of this season there was added a disinclination on the part of investors to enter upon new commitments at a delicate stage of the Korean negotiations. Prices in the gilt-edged market slipped back further, with the result that British Electricity stocks have lost up to a point in the last fortnight. Industrials present a firmer appearance, with activity always ready to develop on news affecting individual issues.

Price Movements

A.E.I. new ordinary shares remain only a few pence below the figure of 75s at which the underwriters were called upon to take up the greater part of the recent offer. Being still transferable free of stamp duty, the new shares stand about 1s above the price of the old. Marryat & Scott 2s shares were called in the market a little better than the official quotation of 5s 9d following the annual profits statement and the maintenance of the dividend at 22½ per cent. Electric Constructions have been slightly easier since the declaration, a week earlier, of a dividend also unchanged. Pye deferred tended to recede in advance of the annual results, but B.E.T. deferred has been well supported since the increase in the distribution.

Aron Meter Results

There was a spectacular reaction in Aron Electricity Meter £1 shares as a result of last week's dividend and profits statement, the price jumping fully 10s to 48s 9d on the declaration of a 20 per cent payment for the year ended last March, and the disclosure of an 80 per cent increase in the trading profit. Later, the shares changed hands at a rather lower level. The distribution includes a 5 per cent bonus in addition to the 15 per cent rate of dividend which has been paid, with few variations, since before the war. Nine-tenths of the £80,000 expansion in earnings is whittled away in a doubling of tax provisions, leaving a net surplus of £42,000, of which the dividend takes £17,000. The latter is, incidentally, less than half the amount provided for the excess profits levy alone. On the new basis, the yield on the shares works out to about 8¼ per cent.

Crompton Parkinson

Very satisfactory trading results for the year ending this month were indicated by Crompton Parkinson, Ltd., on the occasion last week of a special bonus to employees. A few weeks earlier the company had declared an increase in the interim dividend from the long-established rate of 3¾ per cent to 5 per cent. Since it has been the practice for many years to pay two dividends and a bonus all at the same rate, the market placed upon the interim decision a hopeful interpretation which was encouraged further by last week's announcement. Having advanced by the best part of 1s on the first account, the price of the 5s shares hardened further to 10s 3d on the second. Crompton Parkinson have been financing much of the expansion of recent years by means of bank loans, which figured at over £2¾ million at the date of the last balance sheet. The directors were then of the opinion that economic conditions made it undesirable to raise more permanent capital.

London Electric Wire Dividend

Of the 15 per cent distribution for 1952 declared by London Electric Wire & Smiths, 5 per cent was paid as a Coronation bonus, a description which had a "once only" sound about it. Stockholders will be grateful for the chairman's correction of that impression at last week's annual meeting. Earnings for the year, he stated, fully justified the recommendation; and shareholders were entitled to receive a reasonable return on their investment, with due reference to the increased cost of living. The accounts showed the payment to be covered by earnings equivalent to over 90 per cent on the £1 million ordinary capital, and the balance-sheet includes a dividend equalization reserve of £250,000.

Reliance-Clifton Cables

The 5s ordinary shares of Reliance-Clifton Cables & Industrial Products have been quoted at about 27s 6d—nearly the highest for many years—since last month's publication of the annual results. Despite a swingeing increase in tax charges, the net group profit comes out practically £50,000 higher at £152,000. The ordinary dividend is raised from a total of 30 to 35 per cent, which involves the distribution of only one-fifth of the surplus and leaves £120,000 to be added to reserves. In addition there is to be a bonus issue of preference shares in the proportion of one for every £4 ordinary stock held. Without allowance for the value of this bonus, the yield on the shares is close on 6½ per cent.

ELECTRICAL INVESTMENTS

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 29th June 1953	Week's Rise or Fall	Est. Yield £ s d
Gilt-edged and Overseas Stocks					
Brit. Elec. 1968/73	3	3	87½	—	3 8 6
Brit. Elec. 1974/77	3	3	86	—½	3 9 9
Brit. Elec. 1976/79	3½	3½	91½	—½	3 16 6
Brit. Elec. 1974/79	4¼	4¼	101	—	4 4 3
Calcutta Elec. ..	6†	6†	19/-	—1/-	6 6 3†
East African Power	7	7	21/6	—	6 10 2
Nigerian Elec. ..	10	10	22/6	—	8 13 0
Palestine Elec. "A"	5†	Nil	11/-	—1/6	—
Perak Hydro-Elec.	Nil	Nil	15/-	—	Nil
Equipment and Manufacturing					
AberdareCables(5/-)	20	25	16/-	—	7 16 4
Aerialite (1/-) ..	83½	88½	8/9	—	10 1 10
Allen, W. H. ..	15	15	46/3	—	6 9 9
Aron Elec. Ord. ..	15	20	48/9	+10/-	8 4 3
Assoc. Elec. Ord. ..	20	20	73/9	—	5 8 6
Automatic Tel. & El.	15	15	56/3	—⅛	5 6 8
Babcock & Wilcox	18	18	62/9	—	5 14 9
Baldwin, H. J. (2/-)	25	20	4/-	—	10 0 0
Bakelite (10/-) ..	—	12½	17/-	—	7 7 0
British Aluminium	12	12	37/6	—	6 8 0
B.I. Callender's ..	9	10	36/-	—	5 11 0
British Thermostat (5/-)	30	35	31/3	—	5 12 0
British Vac. Cleaner (5/-)	25	25	12/3	—	10 4 2
Brook Motors (10/-)	20	20	32/6	—	6 3 1
Brush Ord. (5/-) ..	10	4	3 3	—	—
A. F. Bulgin (1/-)	30	30	2/9	—	10 18 0
Burco (5/-) ..	38¾	35	17/6	—	10 0 0
Chloride El. Storage	15	20	70/-	—	5 14 4
Cole, E. K. (5/-) ..	25	25*	17/9	—3d	7 0 9
Cossor, A. C. (5/-)..	Nil	10	8/9	—	5 14 3
Crabtree (10/-) ..	17½	17½	28/6	—1/6	6 2 9
Crompton Parkinson Ord. (5/-) ..	11¼	11¼	10/3	+3d	—
De La Rue (5/-) ..	35	Nil	7/6	+6d	Nil
Decca (5/-) ..	112½	150	25/-	—	6 0 0†
Dewhurst (2/-) ..	22½	19*	5/6	—	6 18 3
Dictograph Tel.(2/-)	20	20	5/6	—	7 5 6
E.M.I. (10/-) ..	12	12	13/-	—	9 4 8
Electrical Components (5/-) ..	20	20	10/-	—	10 0 0
Elec. Construction	15	15	52/6	—⅛	5 14 3
Enfield Cable Ord.	7½	5	20/6	—	4 17 6
English Electric ..	15	15	56/-	—	5 7 2
Ericsson Tel. (5/-)	22†	22*†	37/-	—	2 19 6†
Ever Ready (5/-)	35	35	26/-	—	6 14 8
Falk Stadelmann	15	15	42/9	+6d	7 0 2
G.E.C. Ord. ..	22½	22½	40/9	—	5 10 5*
General Cables (5/-)	30	30	16/3	—	9 4 8
Greenwood & Batley	15	17½	40/-	—	8 15 0
Hackbridge Cable (5/-)	20	20	12/-	—	8 6 8
Hackbridge Hewittic (5/-)	18	20	17/-	—	5 17 8
Hall Tel. Acc.(10/-)	10	10	10/-	—	10 0 0
Heatrae (2/-) ..	12½	12½	4/-	—	6 5 0
Henleys (10/-) ..	20	10½*	16/6	—	6 7 3
Holophane (5/-) ..	15	20*	12/6	—	8 0 0
Hoover (5/-) ..	35	25	22/-	—	5 13 8

Company	Dividend Previous	Dividend Last	Middle Price 29th June 1953	Week's Rise or Fall	Est. Yield £ s d
Equipment and Manufacturing (continued)					
Intl. Combustion (5/-)	25	15*	13/9	—3d	5 9 0
Johnson & Phillips	15	15	50/6	—	5 19 6
Lancashire Dynamo	12½	12½*	41/3	—	6 1 0
Laurence, Scott(5/-)	15	15	12/3	—	6 2 6
London Elec. Wire	12½	15	55/-	—	5 9 0
J. Lucas	7½	9½	37/6	—	4 17 9
Marryat & S. (2/-)	22½	22½	5/9	—	7 16 6
Mather & Platt ..	12½	15	48/-	—	6 5 0
Metal Industries ..	10	15	43/3	—	—
Mid. Elec. Mfg. ..	15	15	59/6	—	5 0 10
Murex	12½	15	56/6	+3d	5 6 3
Newman Ind. (2/-)	10	10	2/3	—	8 17 9
Oldham & Son (1/-)	30	35	2/6	—	—
Parnall (Yate) (5/-)	6	6	2/9	—	10 18 2
Parsons, C. A. ..	10*	12½	65/-	—	3 17 0
Plessey (5/-) ..	22½	25	22/6	—	5 11 1
Pye Deferred (5/-)	18	18	17/9	—9d	5 1 6
Revo (10/-) ..	27½	27½	46/-	—	5 19 7
Reyrolle	10*	12½	55/-	—	4 11 0
Scot. Cable (4/-) ..	30	32	11/9	—	—
Siemens Ord. ..	10	10	33/6	—	5 19 6
Southern Areas ..	5	6	13/3	—6d	9 1 3
Strand Elec.(5/-)..	17½	17½	10/-	—	8 15 0
Sturtevant (5/-) ..	17½†	18·1*†	24/-	—	3 15 0†
Switchgear & Cowans (5/-)	22½	22½	14/-	—	8 0 9
Taylor, T. (5/-) ..	20	25	20/-	—	6 5 0
T.C.C. (10/-) ..	20	20*	35/-	—	—
T.C. & M.	10	8½*	27/6	—	6 3 8
Telephone Mfg.(5/-)	10	10	8/3	—	6 1 3
Thorn. Elec. (5/-)..	10	12½	10/6	—	5 19 0
Tube Investments	25	15*	56/-	—	5 7 8
Vactric (5/-) ..	Nil	Nil	5/-	—	Nil
Veritys (5/-) ..	7½	10	4/9	—	10 10 6
Walsall Conduits (4/-)	70	70*	45/6	—	6 3 0
Ward & Goldstone (5/-)	45	45*	33/-	+6d	—
Watford (2/-) ..	25	25	6/9	—	7 8 2
Westinghouse Brake	14	15	53/6	—	5 12 3
West, Allen (5/-) ..	15	15	11/3	—	6 13 4
Trusts, Transport and Communications					
Anglo-Am. Tel.: A Ord.	—	6	84	—1½	7 2 10
Ord.	—	3½	57½	—	6 10 5
Anglo-Portuguese	8	8	21/6	—	7 8 10
Brit. Elec. Traction: Def. Ord. ..	25	35	540	+10	6 9 9
Cable & Wireless: Ord.	8	8	134	+1	5 19 6
4% Loan ..	4	4	96	—	4 3 4
Calcutta Trams ..	6†	6†	22/6	—6d	5 6 8†
Cape Elec. Trams	5	5½	12/-	—	9 3 4
Marconi Marine ..	10	10	29/6	—	6 15 6
Oriental Tel. Ord.	16	16	67/6	—1·6	—
Telephone Props.	8	8	95/-	—	—
Tele. Rentals (5/-)	10	10*	9/-	—	—

* After capital bonus. † Dividends are paid free of income tax.

The above quotations are based upon the middle prices given in the Stock Exchange Daily Official List.

REPORTS and DIVIDENDS

The London Electric Wire Co. & Smiths, Ltd., held its annual meeting on 24th June, Mr. W. J. Terry (chairman) presiding. In the course of his speech, Mr. Terry said that towards the end of 1952 supplies of raw materials became much easier, but this coincided with a falling-off in demand. For the year under review home sales were greater than in the previous year, both in volume and value. A deterioration in trading conditions became apparent in the latter part of 1952 and this state of affairs had persisted, or worsened, particularly during the past three months, mainly due to the uncertainty of the future price of copper. Direct export sales were somewhat lower than in 1951. Import restrictions had been relaxed in some countries, but competition in world markets was intense and it had become increasingly necessary to quote very keen prices and deliveries in order to secure direct business. The electrical industry, however, had a vast export business of which their products were an integral part, the extent of which could not be determined. The new rolling mill, which was in course of erection at their northern undertaking, was nearing completion and was expected to be in operation during the autumn when, if copper was in plentiful supply, it would help greatly in extending the company's activities.

Ultra Electric (Holdings), Ltd.—The consolidated accounts for the year ended 31st March last show that after meeting all charges, including £120,966 for taxation, the net profit is £54,801, as compared with £130,385 for the preceding year. As already reported, the dividend for the year is 12½ per cent (against 10 per cent), and the balance carried forward is £46,095 (against £29,278 brought in).

In his circulated statement, Mr. E. E. Rosen (chairman) says that during the year under review there has been a marked increase in the volume of turnover and a considerable advance towards diversifying and broadening the scope of the business. Their control systems for aero engines and radar and communication equipment will account for an increasing proportion of their turnover. They continue the development and manufacture of equipment for the fighting services and expect this work to be maintained at a steady level for some time to come. Certain defence equipment developed by them is on trial with a view to its eventual adoption by the United States Services. In radio and television they have steadily maintained their share of the market.

An extraordinary meeting will be held on 15th July, following the annual meeting, at which resolutions will be presented for increasing the capital of the company from £315,000 to £450,000.

Thomas de la Rue & Co., Ltd.—A group loss of £78,844 is reported for the year ended 29th March last, as compared with a profit of £659,842 for the previous year, and after providing for taxation the net loss is £125,679 (against a profit of £253,651). The company points out in its preliminary statement that in arriving at the group loss special provisions were made. It is not proposed to pay an ordinary dividend for the year. Undistributed profits total £184,004 (against £319,010). For the previous year an interim ordinary dividend of 20 per cent was followed by a final payment of 15 per cent on capital increased by a 100 per cent scrip issue.

The Renold & Coventry Chain Co., Ltd., reports a group profit, excluding results of French subsidiaries group, of £933,047 for the year ended 31st March last, an increase of £153,275 as compared with 1951-52. United Kingdom taxation is £609,519, and the net profit attributable to the holding company is £323,528 (against £335,672). It is proposed to pay a final ordinary dividend of 8 per cent (against 9 per cent), making 11 per cent for the year (12 per cent). The final dividend is paid on capital increased by a 60 per cent scrip issue. The balance carried forward is £197,001 (against £212,788 brought in).

The Electric Construction Co., Ltd., reports that after providing £137,433 for taxation, the net profit for the year ended 31st March last is £93,503, as compared with £89,373 for 1951-52. General reserve receives £20,000, and £35,000 is allocated to plant replacement reserve. It is proposed to pay an ordinary dividend for the year of 15 per cent (unchanged) on increased capital, and to carry forward £62,530 (against £60,805 brought in).

The Aberdare Electric Co., Ltd.—Lists opened on Monday last for the issue through the Industrial Credit Co. of 1,000,000 5s ordinary shares at 5s 6d a share. Preferential consideration will be given to applications by holders of existing ordinary or " A " ordinary shares. The shares will rank *pari passu* in all respects with the present ordinary and " A " ordinary shares.

W. & T. Avery, Ltd.—The group profit for the year ended 31st March last, after all charges including £1,005,953 for taxation and £72,125 for replacement cost of fixed assets, is £688,530, as compared with £706,470 for the previous year. The proposed final ordinary

ividend is 10 per cent, again making 15 per ent for the year.

Aron Electricity Meter, Ltd.—The profits for the year ended 31st March rose from £96,679 to £176,368, and after charging taxation of £134,567, the net balance is £41,801 (against £34,283). It is proposed to pay a dividend of 20 per cent for the year (against 15 per cent), and to carry forward £57,518 (against £47,728 brought in).

George Kent, Ltd., proposes to pay a final dividend of 9½ per cent, maintaining the total dividend at 12½ per cent. The profit of the parent company for the year ended 31st March was £214,017 (£122,944). The profit figures for the group are not yet available.

The Telephone Mfg. Co., Ltd.—In a statement accompanying the consolidated balance sheet, the chairman states that output should be maintained at its present high level for the greater part of the current year, though he would like to see more orders for delivery during the last three months.

Marryat & Scott Holdings, Ltd., record a net profit for the group amounting to £45,363, after providing £91,154 for tax. The ordinary dividend is maintained at 22½ per cent.

Hick, Hargreaves & Co., Ltd.—After meeting all charges, including £233,076 for taxation, a profit of £168,065 is shown for the year ended 31st March last, as compared with £143,789 for the previous year. The dividend for the year is maintained at 20 per cent by a final payment of 15 per cent.

Johnson, Matthey & Co., Ltd., report a group net profit for 1952-53 of £638,825, as compared with £580,429 for 1951-52, after taxation of £550,054. The final ordinary dividend is 12 per cent, again making 15 per cent for the year.

The Electric & General Investment Co., Ltd.—A net profit of £10,684 is shown for the year to 31st May, as compared with £9,048 for the preceding year. The ordinary dividend for the year is unchanged at 15 per cent.

J. & E. Hall, Ltd., have declared an interim dividend of 2½ per cent (unchanged).

New Companies

Berec (Europe), Ltd.—Registered 12th May. Capital £50,000. To acquire the assets and undertaking of Berec Battery Export Co., Ltd., etc. The first directors are to be appointed by the subscribers. Regd. office : Hercules Place, Holloway, N.7.

Berec (Great Britain), Ltd.—Registered 14th May. Capital £50,000. To acquire the whole or any part of the assets and undertaking of Berec Battery Export Co., Ltd. Regd. office : Hercules Place, Holloway, N.7.

Amagna, Ltd.—Registered 7th May. Capital £100. Manufacturers of and dealers in electrical appliances, radio and television sets, etc. Directors : F. J. Burson and A. E. Harman. Regd. office : 21, Church Street, Warwick.

Rent-A-Lite (Mayfair), Ltd.—Registered 1st June. Capital £500. Electrical, radio, radar, television, electronic, mechanical and optical engineers, etc. Directors : L. S. Brace and Mrs. R. M. Brace. Secretary : Eva L. Gaskin. Regd. office : 16, Manchester Square, London, W.1.

Industrial Vacuum Cleaners, Ltd.—Registered 1st June. Capital £1,000. Manufacturers and dealers in vacuum cleaners, suction plant, cleaning and sweeping tools, etc. Subscribers : C. G. Walton and G. N. Bailey. Solicitors : Waltons, 35-37, King Street, Luton.

Sydun Conveyor Manufacturing Co., Ltd.—Registered 1st June. Capital £100. Engineers, founders, smiths and machinists; electricians and electrical engineers, manufacturers and dealers in electrical apparatus and goods, etc. Directors : N. J. R. Simons and C. S. J. Dunckley. Secretary : C. S. J. Dunckley. Regd. office : Ling House, Dominion Street, E.C.2.

A. Thompson & Son (Chorley Wood), Ltd.—Registered 30th May. Capital £100. Electricians, electrical and wiring contractors, etc. Directors : Dorothy C. Thompson and L. W. Troak. Regd. office : 12, Solesbridge Lane, Chorley Wood, Herts.

M.G. Installations, Ltd.—Registered 30th May. Capital £2,000. To acquire the business of electrical contractors and retailers now carried on by M.G. (Colchester) Electric, Ltd. Directors : S. E. Cawthra, S. A. Martin and H. C. Lait. Regd. office : 28, Crouch Street, Colchester.

M.G. Refrigeration, Ltd.—Registered 30th May. Capital £2,000. To acquire the business of refrigeration engineers and retailers now carried on by M.G. (Colchester) Electric, Ltd. Directors : S. E. Cawthra and S. A. Martin. Regd. office : 28, Crouch Street, Colchester.

Bean Electrical Services, Ltd.—Registered 4th June. Capital £100. Electrical engineers, general electrical installation contractors, wireless and television engineers, etc. Permanent directors : C. A. Masters and G. W. Bean. Secretary : G. W. Bean. Regd. office : 16, High Street, Sandown, Isle of Wight.

Winding-up Petition

Yardley Wavis, Ltd.—A petition for the winding-up of the company, presented by Petters, Ltd., is to be heard at the Royal Courts of Justice, London, on 6th July. Any

person intending to appear should notify Pothecary & Barratt, 73-6, King William Street, London, E.C.4, by 4th July.

Liquidation

Ward & Co. (Dewsbury), Ltd., electrical engineers, 15, Worthgate, Dewsbury. Liquidator, Mr. C. Sykes, 11, Bond Street, Dewsbury, appointed by the creditors on 17th June.

Bankruptcies

B. F. Robbings, radio and electrical retailer, lately carrying on business at 1388, Greenford Road, Greenford Green, Middx, and at 81b, Northolt Road, South Harrow, as "Radio and Electric House."—First and final dividend of 2s 4 5/16d in the £ payable 13th July at the Official Receiver's office, 58-60, York Terrace, Regent's Park, London, N.W.1.

F. E. L. Hester, lately carrying on business at 9, Coal Exchange, Black Diamond Street, Chester, electrical contractor.—First meeting held 2nd July. Public examination 23rd July at the Castle, Chester.

R. Kendall, 66, Sheen Road, Richmond, Surrey, electrical dealer.—Trustee, Mr. C. T. Newman, 3, Central Buildings, Matthew Parker Street, Westminster, S.W.1, Official Receiver, released 16th June, 1953.

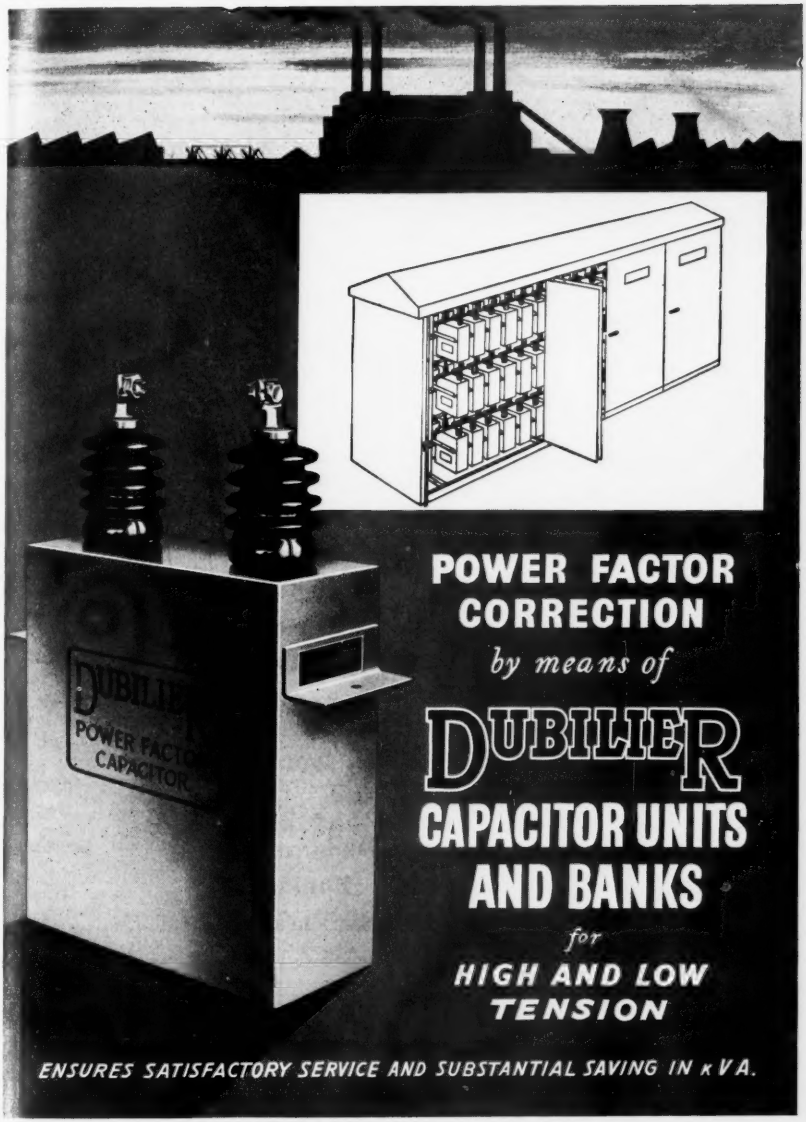
CANADIAN IMPORTS

IN last year's imports of electrical machinery and apparatus into Canada there was a moderate increase on 1951. Included in this advance were storage batteries, dynamos, the larger motors, transformers, telegraph apparatus and radio sets. The United Kingdom improved its position in the trade in switchgear, telephone apparatus and dynamos but lost ground to the United States in steam generators of a kind not made in Canada.

The accompanying table gives the totals of the principal groups in 1952 and the chief supplying countries, together with notes of increases or decreases on 1951.

Class of Goods	1952 $(000)	Inc. or dec. on 1951 $(000)
Batteries, flashlight and parts	109*	− 33
From Hongkong	1	+ 1
„ United States	108	− 34
Batteries, hearing aid and parts	373*	+ 32
Batteries, primary, n.o.p.	296	− 197
From United Kingdom	12	− 15
„ United States	284	− 182
Batteries, storage	1,540	+ 776
From United Kingdom	116	+ 26
„ United States	1,424	+ 750
Telegraph apparatus	3,088	+ 1,265
From United Kingdom	266	+ 185
„ United States	2,813	+ 1,073
Radio sets and other radio apparatus (excluding valves) n.o.p.	23,317	+ 9,102
From United Kingdom	1,906	+ 411
„ United States	21,283	+ 8,651
Telephone apparatus	8,158	− 49
From United Kingdom	2,363	+ 816
„ United States	5,775	− 880
Rheostats, controllers, etc.	8,310	+ 129
From United Kingdom	422	+ 27
„ United States	7,816	− 97
„ Switzerland	58	− 15
Electric irons	194	− 59
From United Kingdom	44	− 36
„ United States	151	− 22
Electric steam generators and parts of a kind not made in Canada	6,526	− 311
From United Kingdom	5,624	− 728
„ Switzerland	144	− 173
„ United States	726	+ 537
Dynamos and parts	8,249	+ 1,514
From Germany	19	+ 9
„ United Kingdom	706	+ 390
„ Switzerland	15	+ 3
„ United States	7,504	+ 1,116
Transformers and parts	4,046	+ 1,296
From United Kingdom	1,318	+ 587
„ Switzerland	289	+ 257
„ United States	2,429	+ 454
Motors, other, and complete parts	16,107	+ 248
From Germany	86	+ 66
„ United Kingdom	2,478	+ 65
„ Sweden	31	− 39
„ United States	13,320	− 806
„ Switzerland	66	+ 49
Motors valued at less than $10	377	− 372
From United Kingdom	38	− 71
„ United States	318	− 308
Switchgear for use in coal mines	139	− 149
From United Kingdom	66	− 46
„ United States	73	− 103
Switches, switchboards, etc.	9,504	+ 1,153
From United Kingdom	819	+ 349
„ Switzerland	470	+ 274
„ United States	8,166	+ 489
Electric heating apparatus n.o.p.	952	+ 66
From United Kingdom	39	+ 13
„ Germany	18	+ 16
„ United States	894	+ 36
Electricity meters	1,446	− 243
From United Kingdom	203	+ 55
„ Switzerland	16	− 14
„ United States	1,227	− 283
Electric dry shavers	1,450	+ 223
From United States	1,313	+ 112
„ United Kingdom	6	− 2
Electrical precision instruments	3,429	+ 866
From United Kingdom	195	+ 51
„ United States	3,180	+ 766
Torchlights, flashlights, side and tail lights	980	− 60
From United Kingdom	60	− 33
„ Germany	9	− 13
„ United States	785	+ 160
„ Hongkong	120	− 149
Lighting fixtures and appliances	4,376	− 553
From United Kingdom	49	− 38
„ Germany	52	+ 12
„ United States	4,036	− 495
„ Japan	39	− 9
Electrical apparatus n.o.p.	16,289	+ 2,737

* Wholly or mainly from United States.



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The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 12th August from the Patent Office, 25, Southampton Buildings, W.C.2.

1947

9405. Standard Telephones & Cables, Ltd.—Devices for obtaining high-frequency circuits over high-tension lines. 9th April, 1947. (695443.)

1948

155. Research Corporation.—Apparatus for generating a beam of charged particles. 2nd January, 1948. (695441.)

4718. Nyrop, J. E.—Method of treating products with electromagnetic energy. 18th February, 1948. (695541.)

1949

7016. Standard Telephones & Cables, Ltd., Wright, E. P. G., and Rice, J.—Automatic telephone systems. 15th March, 1949. (695351.)

15723. Postmaster General.—Radio signalling systems. 1st December, 1950. (695353.)

20405. Standard Telephones & Cables, Ltd.—Route setting apparatus for railways. 28th July, 1950. (695542.)

31004. Wolf Safety Lamp Co. (Wm. Maurice), Ltd., Roedel, P. A., and Jackson, H. M.—Safety lamps. 27th February, 1951. (695626.)

1950

2374. Automatic Electric Laboratories, Inc.—National toll dialling system. 30th January, 1950. (695551.)

3272. Hailwood & Ackroyd, Ltd.—Electric light fittings. 17th January, 1951. (695553.)

4719. Metropolitan-Vickers Electrical Co., Ltd.—Alternating current electrical measuring circuit arrangements. 13th February, 1951. (695364.)

7335. Sunvic Controls, Ltd., and Davis, N. R.—Thermostatically-controlled enclosures. 21st March, 1951. (695631.)

8003. British Thomson-Houston Co., Ltd.—Magnetic cores for electric induction apparatus. 30th March, 1950. (695632.)

10697. Metropolitan-Vickers Electrical Co., Ltd.—Degassing and devolatilizing of low vapour pressure liquids. 26th April, 1951. (695560.)

17491. Siemens - Reiniger - Werke Akt.-Ges.—Electro-medical irradiation apparatus. 12th July, 1950. (695374.)

18727. British Broadcasting Corporation.—Recording of television signals. 19th July, 1951. (695377.)

22535. Drager, O. H.—Method and apparatus for the determination of electrical conductivity. 13th September, 1950. (695568.)

22656. General Electric Co., Ltd.—Electrical resistance heating elements. 10th September, 1951. (695473.)

22781. Licentia Patent-Verwaltungs-Ges.—High-tension separator switch particularly for erection in the open air. 15th September, 1950. (695380.)

24741. Murphy Radio, Ltd., and Rowlinson, R.—Incandescent lamp holders. 8th October, 1951. (695381.)

27982. Bradbury & Sons, Ltd., J., and Powell, V.—Hydraulic pumping units comprising electric motors of low-starting torque. 2nd November, 1951. (695386.)

28375. British Thomson-Houston Co., Ltd.—Electric discharge devices. 23rd November, 1950. (695481.)

29076. Crabtree & Co., Ltd., J. A., and Hill, W. E.—Terminal ends of electric conductors. 27th November, 1951. (695389.)

1951

3104. Philips Electrical Industries, Ltd.—Circuits for stabilizing cathode-beams in alternative positions. 9th February, 1951. (695584.)

4284. Ultrasonics, Ltd.—Apparatus for the mechanical production of acoustic vibrations for use in emulsification, dispersion or like processes. 12th February, 1952. (695491.)

4782. Soc. d'Electronique et d'Automatisme.—Circuits for controlling the flow of electric current through inductive loads. 27th February, 1951. (695587.)

6272. Carton, J.—Standard sources of electromotive force. 15th March, 1951. (695405.)

6769. British Thomson-Houston Co., Ltd.—Vehicle signalling systems. 21st March, 1951. (695655.)

6893. Philips Electrical Industries, Ltd.—Electric discharge tubes for intensifying fluorescent images produced with the use of X-rays. 22nd March, 1951. (695406.)

8035. Standard Telephones & Cables, Ltd.—Automatic telecommunication exchange system. 6th April, 1951. (695497.)

10045. Thermoset Appliances, Ltd., and Douce, N.—Means for introducing supply leads into electrically heated appliances. 22nd April, 1952. (695662.)

11404. Ericsson Telephones, Ltd., and Distin, L. S.—Polarized electromagnetic devices. 16th May, 1951. (695664.)

11686. Metropolitan-Vickers Electrical Co., Ltd.—Dynamo-electric machines. 28th March, 1952. (695415.)

12617. Marconi s Wireless Telegraph Co., Ltd.—Radio transmitters. 31st January, 1952. (695416.)

13906. Radio Industrie.—Methods and apparatus for the transmission of electric signals. 12th June, 1951. (695417.)

16849. Garrett Corporation.—Electric-fluid power unit. 16th July, 1951. (695672.)

19993. Standard Telephones & Cables, Ltd. (Lorenz Akt.-Ges., C.).—Electromagnetic electron beam deflection systems. 24th August, 1951. (695607.)

23417. Trefileries et Laminoirs du Havre.—Insulating sector conductors of electric cables. 8th October, 1951. (695524.)

23825. Philips Electrical Industries, Ltd.—Luminescent materials. 12th October, 1951. (695527.)

24586. British Thomson-Houston Co., Ltd.—Electric motor control systems. 22nd October, 1951. (695530.)

24590. Dunlop, S. (Winchester Electronics, Inc.).—Electrical plug-and-socket connectors. 22nd October, 1951. (695679.)

25483. Landis & Gyr Akt.-Ges.—Regulator for electrically heated hot plates. 31st October, 1951. (695681.)

27199. Westinghouse Electric International Co.—Elevator control system, embodying a.c. motors. 20th November, 1951. (695682.)

28043. Edison Swan Electric Co., Ltd.—Electric circuit arrangements for generating push-pull waves. 29th November, 1951. (695430.)

28296. Telefonaktiebolaget L. M. Ericsson.—Methods for producing contact springs for electrical apparatus. 3rd December, 1951. (695683.)

28375. Allmanna Svenska Elektriska Aktiebolag.—Overvoltage protective device. 4th December, 1951. (695431.)

1952

103. Standard Telephones & Cables, Ltd.—Frequency changing circuits for receivers of short electromagnetic waves. 1st January, 1952. (695616.)

164. Rauland Corporation.—Electron discharge tubes for colour television. 2nd January, 1952. (695617.)

2334. Universal Winding Co.—Machines for winding electrical coils. 28th January, 1952. (695618.)

3265. British Thomson-Houston Co., Ltd.—Piston wrist pin assemblies. 7th February, 1952. (695537.)

3424. Metropolitan-Vickers Electrical Co., Ltd.—Induction electron accelerators. 8th February, 1952. (695688.)

3519. Schaeffer, P.—Devices for the sterephonic transmission of music. 11th February, 1952. (695435.)

7395. Belling & Lee, Ltd.—Electric plug-and-socket connectors. 21st March, 1952. (695439.)

12134. Philips Electrical Industries, Ltd.—Switches comprising a series of contacts. 16th May, 1952. (695694.)

12725. British Thomson-Houston Co., Ltd.—Sheet electric heater insulating material. 20th May, 1952. (695697.)

20360. Westinghouse Electric International Co.—Bonded magnetic cores and processes for producing them. 13th August, 1952. (695700.)

29326. Research Corporation.—Method of generating a beam of charged particles. 2nd January, 1948. Divided out of 695141. (695539.)

NETHERLANDS ELECTRICAL TRADE

Analysis of Last Year's Imports and Exports

ELECTRICAL imports into the Netherlands last year increased slightly in value on 1951, namely, from Gld. 892 million to Gld. 896 million. Of this total Gld. 293 million represented electrical machinery and equipment and Gld. 603 million other electrical goods. The totals of some leading groups in 1952 with notes of increases or decreases on the previous year are shown in the accompanying Table 1. Noteworthy features were increases in imports of motors, accumulators and electro-medical apparatus and a big increase in cables and vacuum cleaners. Telephone apparatus, although showing a small decline, remained a big import item. Among supplying countries, West Germany came back actively in most lines, while Britain's share on the whole was small. Netherlands exports of electrical materials last year rose in value by about 12 per cent on 1951 but were approximately Gld. 226 million below imports. (The guilder equals about 2s.)

Table 1.—Imports of Electrical Goods and Machinery

Class of Equipment	1952 Gld. (000)	Inc. or dec. on 1951 Gld. (000)
Motors, 10 kg. or less	2,103	+ 699
From United Kingdom	1,349	+ 606
,, *West Germany*	314	+ 57
Motors over 10 kg.	19,342	+ 743
From United Kingdom	2,458	— 967
,, *Belgium–Luxemburg*	2,043	— 1,482
,, *West Germany*	8,082	+ 912
Transformers, 10 kg. or less	2,256	36
From Belgium–Luxemburg	1,646	— 74
,, *United Kingdom*	229	+ 45
,, *West Germany*	233	+ 35
Static convertors over 10 kg.	2,520	+ 331
From United Kingdom	849	— 535
,, *West Germany*	1,041	+ 702
Accumulators	3,935	+ 1,202
From Belgium–Luxemburg	1,111	+ 166
,, *West Germany*	565	+ 101
Vacuum cleaners	1,575	— 2,634
From United Kingdom	324	— 1,611
,, *Sweden*	599	— 374
,, *West Germany*	575	— 456
Electro-medical apparatus other than tubes	5,020	+ 1,790
From United Kingdom	892	+ 272
,, *West Germany*	1,565	+ 214
,, *Italy*	1,030	+ 523
Radio valves	18,456	+ 5,384
From Belgium–Luxemburg	7,552	+ 4,053
,, *United Kingdom*	3,195	+ 1,038
Radio receiving apparatus	45,916	— 1,680
From Belgium–Luxemburg	37,974	— 630
Telephone apparatus	22,396	— 252
From Belgium–Luxemburg	10,470	— 748
,, *Sweden*	3,498	+ 591
,, *Switzerland*	3,727	— 519
Insulated wires and cables	13,100	— 8,155
From Belgium–Luxemburg	5,614	— 1,131
,, *West Germany*	2,427	— 6,064
,, *United Kingdom*	2,336	— 1,803

Larger Rise in Exports

The electrical export trade last year amounted in value to Gld. 671 million compared with Gld. 587 million in 1951. Of the 1952 total Gld. 446 million was classed as representing electrical machinery and equipment and Gld. 225 million as other electrical material. Some of the principal groups, with notes of increases or decreases within the period under review, are shown in Table 2. Principal customers include most European countries—particularly Belgium–Luxemburg—Indonesia and other eastern markets, together with many parts of Latin America.

Table 2.—Electrical Exports

Class of Equipment	1952 Gld. (000)	Inc. or dec. on 1951 Gld. (000)
Motors, 10 kg. or less	770	— 57
Ditto, over 10 kg.	5,467	+ 1,02
Static transformers, 10 kg. or less	3,041	+ 2,90
Vacuum cleaners	11,198	+ 1,94
Hair cutters and clippers	15,757	+ 4,51
M.f. lamps	29,000	— 8,00
Radio valves	65,316	— 3,63
Radio receiving equipment	111,038	— 6,20
Telephone apparatus	15,750	+ 7,40
Loud speakers, microphones, etc.	5,211	— 1,01
Current regulating and control apparatus	11,025	— 1,60

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—BRISBANE.—26th August. State Electricity Commission of Queensland. Producer gas engine driven generating plant (150-200 kW) for the Barcaldine Shire Council. (C.R.E. 20904/53. Ten/6676.)*

Belfast.—31st July. City Electricity Committee. Valves and penstocks at Belfast West power station. (See this issue.)

British East Africa.—NAIROBI.—11th July. County Council. Telephone installation in the offices now under construction. (C.R.E. 21944/53. Ten/6692.)*

Chertsey.—16th July. U.D.C. Street lighting equipment. (See this issue.)

Derby.—9th July. Town Council. Electrical installations in 100 houses, Mackworth estate. Borough architect, Corporation Street.

Dover.—20th July. Corporation. Street lighting equipment. (See this issue.)

Egypt.—CAIRO.—7th July. Cairo Electricity and Gas Administration. Supply of 11 kV underground cable. (C.R.E. 21097/53. Ten/6653.)*

India.—TRIVANDRUM.—27th July. Government of Travancore-Cochin. Underground cable. (C.R.E. 21982/53. Ten/6690.)*

Lanark.—County Council. Street lighting equipment. (See this issue.)

Nantwich.—14th July. R.D.C. Electrical installations in 82 houses, various sites. H. Crabtree, surveyor, Stapeley.

Newbiggin (Northumberland). — 16th July. U.D.C. Electrical work in connection with the erection of a further 30 houses on the Spital estate. H. S. Robson, surveyor, Council Offices.

Newcastle-on-Tyne.—19th August. Education Committee. Electric lighting, power and impulse clock installations at the new Stocksfield Avenue School. R. W. Gregory & Partners, consulting engineers, Pilgrim House.

New Zealand.—WELLINGTON.—7th August. Post and Telegraph Department. Supply of insulation testers, microammeters, multi-range meters and voltmeters. (C.R.E. 21535/53. Ten/6658.)*

North of Scotland.—Hydro-Electric Board. Lighting, heating and auxiliary cabling installation at Errochty Dam intake and compensation turbine house. (See this issue.)

Omagh.—22nd July. Tyrone County Education Committee. Electrical installation at Dennamona Primary School, Fintona. Specification, etc., from the chief education officer, Education Offices.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

Pakistan.—KARACHI.—15th July. Department of Supply and Development, Frere Road, Karachi. Diesel electric generating sets (30, 50 and 75 kW) with auxiliaries, switchgear and other accessories. (C.R.E. 20266/53. Ten/6662.)*

Portuguese East Africa.—LOURENCO MARQUES.—20th July. Directorate of Ports, Railways and Transport, Mozambique. Various electrical material and equipment. (C.R.E. 20745/53. Ten/6674.)* 27th July. One 50 kVA generating unit. (C.R.E. 20746/53. Ten/6673.)*

South Africa.—PRETORIA.—16th July. Union Tender and Supplies Board. 137 petrol driven battery chargers. (C.R.E. 21766/53. Ten/6680.)*

Southport.—20th July. Town Council. Electrical work, passenger lift, etc., in connection with extensions and alterations to premises in Oxford Road, Birkdale. Borough architect, Lord Street.

United States. — SEATTLE. — 5th August. Corps of Engineers, U.S. Army. Two 4.16 kV 1,200 A, 50 MVA air circuit breakers and four 15 kV 600-5 A current transformers for the Chief Joseph Dam. (C.R.E. 21769/53. Ten/6675.)*

DENVER. — 21st July. Department of the Interior, Bureau of Reclamation. Main control and distribution boards and battery charger for the Sioux City substation of the Missouri River Basin Project. (C.R.E. 21479/53. Ten/6691.)*

ORDERS PLACED

Feltham. — London Airport. Accepted. Fifteen passenger lifts in Passenger Handling Building.—Marryat & Scott, Ltd.

London.—City Corporation. Installation of electric lighting in Viaduct Buildings, Saffron Hill (£1,399).—Haines & Sheppard, Ltd.

Lowestoft.—East Anglian Regional Hospital Board. Recommended. Electrical installation work at the Lowestoft and North Suffolk Hospital, Lowestoft (£4,894).—Eastern Electricity Board.

Worcester.—City Council. Renewal of electrical installation at the Guildhall (£1,679).—Abell & Smith's Electrical Co., Ltd.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Birmingham.—Works extensions; Hercules Cycle Co., Ltd., Salford Street, Aston.

Doncaster.—Industrial office block; International Harvester Co., Ltd. Wheatley Hall Road.

Dunstable.—Factory; Commer Cars, Ltd., Biscot Road, Luton.

Elstree. — Factory, Barnet By-pass Road; Furzehill Laboratories, Ltd., Shenley Road.

Gateshead.—Factory, Team Valley Trading Estate, for Robert Hirst & Co., raincoat manufacturers, Hammerton Street, Bradford.

Hendon.—Eight shops with maisonnettes over, at Claremont Road, N.W.2; L. Worden, town clerk, Town Hall, N.W.4.

Kent.—Additions to schools at Broadstairs, Southborough and Northfleet, new secondary school at Hoo, and new fire station at Canterbury; Kent county architect, Springfield, Maidstone.

Leyland.—Erection of licensed premises at Cow Lane (£100,000); Greenall, Whitley & Co., Ltd., St. Helens.

Llanelly.—Colliery building, Sylen; National Coal Board, Hobart House, Lower Grosvenor Place, S.W.1

Llangefni.—Houses (30), and conversion of Pencraig into flats, clubroom, etc.; A. J. Evans, clerk to U.D.C., Church Street.

London.—CAMBERWELL.—Flats (108), Croxted Road/Acacia Grove site; town clerk, Town Hall, Peckham Road, S.E.5.

FINSBURY.—Flats (192), Roscoe Street; Peabody Donation Fund, 17, Buckingham Street, W.C.2.

ISLINGTON.—Houses (70), Mildmay Centre site, in 10-storey block; H. Dixon Clark, town clerk, Upper Street, N.1.

PECKHAM.—Flats (108), Croxted Road; F. S. Palling, architect, 118, Merrion Avenue, Stanmore.

SYDENHAM. — Extensions to County School (£345,000); Basil Spence & Partners, architects, 48, Queen Anne Street, W.1.

Lytham St. Annes.—County secondary school (£142,460); county architect, Preston.

Maidstone. — Houses (42), Market Place, Staplehurst; G. G. Letchford, clerk to R.D.C., 26, Tonbridge Road.

Manchester.—Eight- and ten-storey flats at Ridgeway Street, Ancoats (estimated cost £1,138,000); city architect.

Meriden.—Houses (12), Church Lane, Over Green, Wishaw; Osborn & White, architects to R.D.C., 190, Broad Street, Birmingham, 15.

Merton and Morden.—Block of flats at West Barnes Lane; H. May, clerk to U.D.C., Morden Hall, S.W.19.

Minsterley (Salop).—Factory for Minsterley Creameries, Ltd.; W. Higley & Son, 9, Pride Hill Chambers, Shrewsbury.

Nottingham.—Laboratories at Meadow Lane for Trent River Board; J. Hirst, clerk of the Board, 206, Derby Road.

Penrith.—Community centre in De Whelpdale Lane, including dance hall, concert hall and exhibition gallery; W. Binney, architect, The Cloisters, Appleby, Westmorland.

Peterborough.—Secondary school for girls, Dogsthorpe North estate (£82,000), and extension of County Grammar School for Girls (£36,500); architect to Joint Education Board, Bridge Street, Peterborough.

Rainham.—Factory, New Road; Horn Construction Co., Ltd., Finsbury Pavement House, E.C.2.

St. Mellion.—Reconstruction of Village Hall; Higman & Ford, architects, 2, The Parade, Liskeard.

Salford. — Four-storey flats, St. Stephens Street; city engineer.

New school at Ordsal (£150,000); Hallidey & Agate, architects, 14, John Dalton Street, Manchester.

Seaton Burn.—School meals central kitchen (£20,000); A. Carr, Stoddart Street, Shieldfield, Newcastle-on-Tyne.

Seaton Delaval (Northumberland). — Bus station; T. Burgess, surveyor, U.D.C. Offices.

Sheffield.—Houses, Hackenthorpe estate for T.C.: T. V. Simpson (46), J. W. Sivil, Ltd. (38 and 36 flats), Wm. Memmory & Sons, Ltd. (38), J. F. Finnegan (Sheffield), Ltd. (122), F. Ridal & Sons (Builders), Ltd. (54), C. L. Marcroft, Ltd. (38), Reeves Charlesworth, Ltd. (34 and 8 flats), all of Sheffield.

Sherborne. — Houses (30), Harbour Road; Petter, Warren & Royden Cooper, architects, The Old Oxford Inn, West Hendford, Yeovil.

Skelmersdale.—Houses (80), Manor House site; U.D.C. surveyor.

Southampton.—Factory, Bursledon Road; Burts & Harvey, Ltd., Eling House, Totton.

Departmental store; John Lewis & Co., Ltd., Oxford Street, W.1.

South Shields.—Houses (109) on the Simonside estate; borough engineer, Town Hall.

Southwell. — Secondary modern school; Phillips, Son & Norfolk, architects, 26, Annesley Grove, Nottingham.

Spennymoor (Co. Durham). — Houses, Byers Green (50), Middlestone Moor (200) and Kirk Merrington (50); surveyor, U.D.C. Offices, Spennymoor.

Stafford.—Rebuilding offices at Martin Street for J. Mottram, Ltd.; R. E. Hawkins, architect, Market Place, Cannock.

Stamford.—Houses (48), Drift Road estate; F. J. Lenton & Partners, Broad Street, Stamford, Lincs.

Stoke-on-Trent.—Main shopping centre on the Blurton Farm estate; W. A. Bott, borough surveyor, Town Hall.

Stretford.—Flats (36) at rear of "Ingleby" site; borough surveyor.

Swansea.—Factory, Penfilia Road; Fred Holt & Sons, Ltd., Orange Street.

Showrooms and offices, town centre; G. A. Downie, surveyor, Dowlais Chambers, West Bute Street, Cardiff.

Torquay.—Factory, Coombe Road; Nevlyn Knitting Co., Ltd., The Fradgan, Newlyn.

Wakefield.—Laboratory; Matthew Walker & Sons, Ltd., Alverthorpe Mills.

Walsall.—Trolley-bus garage in Carl Street (£75,000); M. E. Habershon, borough surveyor.

Wigton.—Houses (154), Western Bank estate; R.D.C. surveyor.

Worksop.—Secondary technical school for Notts E.C.; Eberlin & Darbyshire, architects, 3, College Street Nottingham.